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AgRISTARS

Agriculture and Resources Inventory Surveys Through Aerospace Remote Sensing

NASA
National Aeronautics and Space Administration

Lyndon B. Johnson Space Center
Houston, Texas 77058

ENUMERATOR'S MANUAL

1981 GROUND DATA SURVEY

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1980 GROUND DATA SURVEY MANUAL

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1.1 Survey Purpose

1.1.1 Background Material on AgRISTARS

AgRISTARS (Agricultural and Resource Inventory Surveys Through Aerospace Remote Sensing) is an extensive six-year research program (October 1, 1979 - September 30, 1985) designed to determine application of aerospace remote sensing for answering questions about agricultural resources and for meeting information needs of the U.S. Department of Agriculture. The program is a cooperative effort of the Departments of Agriculture, Commerce, and Interior, the National Aeronautics and Space Administration, and the Agency for International Development.

The primary goal of the program is to determine the extent to which aerospace remote sensing data can be used to improve the objectivity, reliability, timeliness and adequacy of USDA information for support of national agriculture and trade policies. A secondary goal is to incorporate technology which may result from these investigations into routine use in either existing or future Department of Agriculture information systems.

The AgRISTARS technical program is structured into eight major projects as follows:

1. Early Warning/Crop Condition Assessment
2. Foreign Commodity Production Forecasting
3. Yield Model Development
4. Supporting Research
5. Soil Moisture
6. Domestic Crops and Land Cover
7. Renewable Resources Inventory
8. Conservation and Pollution

The Early Warning/Crop Condition Assessment project is responsible for development of methods which will give early warning of changes that may affect the production and quality of agriculture commodities and of renewable resources such as timber. This project will involve 19 crop/region combinations in the U.S. and six foreign countries (USSR, Argentina, Brazil, People's Republic of China, Mexico and Australia) for six major commodities (wheat, barley, corn, soybeans, rice and cotton).

SECTION 1
GENERAL INFORMATION AND
ADMINISTRATIVE INSTRUCTIONS

The Foreign Commodity Production Forecasting project will develop and test procedures for using aerospace remote sensing technology to provide more objective, timely, and reliable crop production forecasts several times during the growing season and improved pre-harvest estimates for the crops and regions of interest. This activity involves 12 crop/region combinations in the U.S. and 6 foreign countries (USSR, India, Argentina, Brazil, Canada and Australia) for 5 major commodities (wheat, barley, corn, soybeans and rice). Testing will be conducted of the capability to make estimates of production in foreign countries to provide an assessment of improvements made by remote sensing. In addition, the technology will be evaluated in similar U.S. "yardstick" regions where extensive ground observations are available to permit more detailed comparison.

The Yield Model Development project will conduct basic research to determine how various environmental factors affect plant growth and development. Researchers will develop and test crop yield forecast techniques designed to provide improved crop production forecasts. Objective yield measurements will be made in twelve special segments located in Colorado, Montana, North Dakota, Oregon and Texas during 1981.

The Supporting Research project addresses research, development and testing of new and improved technology for each of the other projects, primarily Early Warning and Foreign Commodity Production Forecasting. The exploratory experiments for production forecasting will be carried out by Supporting Research. Other research responsibilities include sampling and aggregation techniques, land area estimation, crop development stage estimation, and crop stress assessment. Ground truth data will be a vital resource for these experiments, especially for constructing crop development calendars and in sampling research.

Soil Moisture research is directed toward developing measures of soil moisture (in-sites and remotely) for potential use in other applications such as early warning uses, crop yield estimation, watershed runoff, and vegetative stress assessments.

Domestic Crop and Land Cover objectives are aimed at developing techniques for automatic classification and estimation of land cover with emphasis on major crops. Landsat data will be used in conjunction with ground data to improve the precision of crop classification and area estimation at the substate level. The project will concentrate on Iowa, Kansas, Missouri and Oklahoma in 1981. Ground data will be collected as a part of the June Enumerative Survey.

The Renewable Resources Inventory will concentrate on development of techniques to estimate the quantity of renewable resources such as timber, and search out improved methods for monitoring changes to the inventory of renewable resources.

The Conservation portion of the Conservation and Pollution project will develop an inventory of conservation practices, estimate water runoff, determine physical characteristics of snowpacks and make estimates of soil moisture from data provided through remote sensing techniques. The Pollution portion of the project will provide an assessment of conservation practices by using remote sensing techniques to assess the amount of sediment runoff, to detect air pollutants, and to assess their impacts on agricultural and forestry products.

The AgRISTARS six year program cost is estimated to be $332 million. USDA will contribute an estimated $134 million, NASA an estimated $177 million and NOAA an estimated $21 million. The ESS budget for AgRISTARS related projects is expected to grow from about $5 million in 1980 to nearly $20 million in 1985, the last year of the project.

Since AgRISTARS is a large and lengthy research project, goals have been established to give a basis for planning and a means for measuring progress throughout its life. Specific milestones for each of the eight projects have been established for each year. A gross summary of these milestones is presented here to give an overview of the direction and flow that AgRISTARS will take.

1980 - This was the "getting started" year. Most of the research teams were assembled. They are evaluating existing technologies to determine those that might be suitable for use in remote sensing research and planning development of new tools where none now exist. Data bases are being created to contain a variety of already existing information that will be needed to operate and evaluate pilot tests. A few pilot tests were conducted.

1981-82 - These years will be devoted to conducting and evaluating pilot tests designed to test the remote sensing methods as they are being developed. The purpose of these tests is to "perfect the tools" in preparation for the large-scale tests that will follow. The ground data collected during 1979, 1980, and 1981 will be used in the evaluations of these pilot tests.

1983-84 - Large-scale applications tests designed to produce estimates of crop production for the regions and crops that are of interest to the project will be conducted. These estimates (to be made a year or more after the crops are produced) will be compared with official production estimates to assess the accuracy of estimates produced through methods based on remote sensing.

1985 - Completion of the large-scale applications tests will receive greatest attention. Evaluations of the accuracy of these estimates will continue. USDA will begin to study the feasibility of incorporating remote sensing techniques into routine use in either existing or future Department of Agriculture information systems.

1.1.2 The Role of Ground Data

Ground data play three key roles in development of remote sensing technologies.

1. It is the only reference that can be used for initial interpretations of data collected by satellite. When the satellite was put in orbit, scientists knew it could sense energy reflected and radiated from the earth in four light bands. Without ground data, an analyst could never begin to distinguish corn from lakes or soybeans from sunflowers by looking at satellite data. Ground data are the basis for learning how to sort and classify satellite data. Of course the learning cycle is much farther advanced than this example shows, but it is still continuing.

2. Once analysts feel that they understand how to interpret satellite data, they try to analyze it without benefit of ground data. When the analysis is complete, ground data are used to assess how well the analysts interpreted the data. This stage is normally known as accuracy assessment.

3. Ground data that are collected periodically over a crop season provide the basis for construction of a calendar representing crop development in areas where the data were collected. By comparing calendars for the same crop in several areas, analysts can determine how much variability in crop development is caused by differences in soil and climates. By comparing the crop development calendar for an area with temperature and rainfall calendars, analysts can determine how much of the variability in crop development is attributed to these factors. Knowledge of these relationships is vital to the development of methods of forecasting crop production through remote sensing techniques.

1.2 Your Job

You are one of about 350 enumerators in 30 states employed to collect ground observed data. These data will be used to support research and develop techniques for estimating crop acreage and production by remote sensing from satellites.

Your important part of this work is to collect the ground observed data needed to evaluate how accurately remote sensing techniques can identify and monitor crop progress from data gathered by satellite. In many segments, periodic visits will be made to selected fields containing specified crops to observe crop growth progress, and obtain planting and harvesting information for selected fields. On the initial visit to the segment, you will select the fields that will be observed throughout the crop season, and

contact the operators of these fields to collect data concerning planting and emergence dates, seeding rates and row widths and direction. These fields will be visited every 9 or 18 days to observe crop growth characteristics. After the crop in each field has been harvested, you will again contact the operator for information about harvesting procedures and dates. A land use inventory to record the use of each field or land area will be completed for all segments. Some segments will be used to collect a land use inventory only.

1.3 Terms and Definitions

It will help you in your job to become familiar with the following terms. They have special meaning for this project.

A. nm - Nautical Mile, about 1.15 statute miles.

B. Segment - A 3.6 X 6 nm land area outlined on aerial photos and maps. Each segment is identified by a permanently assigned 3 or 4 digit number.

C. SEA/AR Segments - Twelve 4 square mile segments located in Colorado, Montana, North Dakota, Oregon and Texas.

D. Intensive Study Segments - Segments where observed crop progress data will be collected every 9 days.

E. Land Use Inventory - Accounting for each field or parcel of land within a segment.

F. Periodic Fields - Specified crop fields, larger than 25 acres selected for either 9 or 18 day visits.

G. Crop Development Data - Observations concerning plant height, growth stage, and ground cover and yield distractants within a field.

1.4 Equipment and Supplies

The supplies used for ground observed data collection are listed below. You are responsible for the proper use and care of all items furnished. If supplies run low, notify your supervisory enumerator immediately.

A. Supplied by State Office

Identification Card
ADM-008 and ADM-009 Forms
Ballpoint pen
Steel tape - 12 feet
Return envelopes (20)
Mailing labels
Flagging Ribbon
Rain gauges
Map Board

B. Contained in Segment Kit for Periodic Observations

Map (1)
Aerial Photos - Black and White
1 with preselected fields marked and raingauge grid
1 with raingauge grid only
Observation schedule
Form A: Initial Interview Form
Form B: Periodic Observation Form
Form C: Final Interview Form
Form D: Comment Form
Form E: Rainfall Observation Form
Map Tube (for mailing photos)

C. Contained in Segment Kit for Land Use Inventory

Map (1)
Two Infra-red Photos with overlays
Special pencils for marking on overlay

1.5 Survey Calendar

Date	Event
March 23 - June 1	Receive Periodic Observation Kit, all states. Begin field work depending on normal planting dates or winter wheat green-up.
May 1 - 15	Receive Inventory Kits for Winter grains.
June 1 - 15	Start collecting rain gauge forms.
July 25	Last day replacement fields can be selected.
August 1	Form A due at State Office
Aug 1 - 15	Receive Inventory Kit for remaining sites.
Aug 1 - Sep 30	Complete Land Use Inventories.

1.5 (Con'd)

Date	Event
Oct 1 - 15	Collect last rain gauge forms.
October 31	End periodic observations.
Nov 16 - 20	Segment visit to complete Form C.
Dec 14 - 18	Final segment visit to complete Form C.
Jan 4 - 8, 1982	Return all unused survey materials to State Office.

2.1 General

A comprehensive pesticide safety program has been developed for all employees who may be exposed to pesticides while collecting ground data. The program is designed to protect you from the possibility of overexposure to harmful pesticides. Overexposure to pesticides, particularly insecticides, could result from home, garden and farm use as well as unrestricted work collecting ground data. Ground data collections will pose little or no danger to your health when the safety precautions listed in these instructions are followed.

The safety program provides for monitoring and restricting exposure to organophosphorous insecticides. These insecticides are highly toxic to humans within several hours after application. The toxicity drops over time, but the rate of decline depends on the product used, application rate, weather factors and other variables. Organophosphorous insecticides have been in common use for several years. Usage has increased sharply since application of DDT is now prohibited. Organophosphorous insecticides are used on most crops; however, usage on corn and soybeans in a spray or dust form is not generally recommended unless an unusual pest outbreak occurs. Use of organophosphorous insecticides for control of pests in cotton is quite intensive in most commercial producing areas throughout much of the growing season. Extreme caution must be taken to avoid overexposure to these insecticides in all crops.

2.2 Determine if Organophosphorous Insecticides Were Used

To provide maximum protection for your health, the pesticide safety program requires that you take the following precautionary measures.

A. All Crops

On Form A and Form B, you will ask if any pesticide with organophosphorous content has been applied. If YES, you will obtain the name of the pesticide and the latest application date. You should explain to the farmer that you work in many fields on many different farms during a short period of time and that the sole purpose of the question is to insure that you will not be unnecessarily exposed to harmful insecticides. Information notes, such as: "The operator will not apply a pesticide"; "Will apply some later"; "_____(name of pesticide) was applied on _____(date)", should be entered on the kit envelope for future reference.

Lists of organophosphorous insecticides are provided for each crop. Lists include the common names of recommended insecticides along with many trade names. If a trade name is not listed, you should determine the common name of the insecticide from the farm operator, insecticide dealer or County Extension Service. If an insecticide does not appear on the lists, the insecticide dealer or your County Extension Service should be able to tell you if it is an organophosphorous insecticide. If an insecticide used on corn or soybeans does not appear on the lists, check the larger cotton insecticide list.

If the operator informs you on the initial interview that no pesticides with organophosphorous content will be applied, you should write a note to this effect on the kit envelope. However, when you arrive at the sample field at a later visit and it appears the operator may have applied a pesticide because of an odor in the air, residue on leaves, the presence of spraying or dusting machinery, other farmers in the area are spraying, or any other evidence, contact the operator before beginning your observations. If the operator applied a pesticide or is undecided, you should contact him/her on each visit to check the application date.

B. Corn

Many of the recommended insecticides for corn which are applied as a spray or dust to the foliage are on the following lists.

ORGANOPHOSPHOROUS COMPOUNDS		OTHER COMPOUNDS
Malathion	Phorate	Carbaryl
Cythion	Thimet	Sevin
Parathion	Trichlorfon	
Stathion	Dylox	
Niran	Dipterex	
Thiophos	Neguvon	
Alkron	EPN	
Diazinon		
Spectracide		

C. Cotton

Generally, operators should be contacted by phone a few days before a scheduled observation to determine their spraying schedule. Check the insecticides being used against the following organophosphorous pesticide list. Enter the latest application date and the name of the pesticide if organophosphorous insecticides were applied. STAY OUT OF FIELD 3 DAYS (72 HOURS) AFTER APPLICATION OF INSECTICIDES WITH ORGANOPHOSPHOROUS CONTENT.

INSECTICIDES FOR COTTON PEST CONTROL

Organophosphorous Compounds

Trade Name	Common Names
Azodrin	Monocrotophos
Bidrin	Dicrotophos
Cygon	Dimethoate
Diazion	Diazion
Dibram	Naled
Dimecon	Phosphamidon
Dipterex	Trichlorfon
Di-Syston	Disulfoton
Dylox	Trichlorfon
EPN	EPN
EPN 300	EPN
Ethion	Ethion
Guthion	Azinphosmethyl
Malathion	Malathion
Metacide	Methyl Parathion
Methyl Parathion	Methyl Parathion
Methyl Trithion	Methyl Trithion
Monitor	Methamidophos
Nialate	Ethion
Niran	Parathion
Parathion	Parathion
Rogor	Dimethoate
Supracide	Geigy 13005
Systox	Demeton
Thimet	Phorate
Thiodemeton	Disulfoton
Thiophos	Parathion
Trithion	Carbophenothion
Ultracide	Geigy 13005
Wofatox	Methyl Parathion

Organochlorine Compounds

Kelthane	Dicofol
Thiodan	Endosulfan
	Chlordane
	Chlorobenzilate
	Endrin
	Dieldrin
	Toxaphene

Other Compounds

Fundal	Chlordimeform
Galecron	Chlordimeform
Lannate	Methomyl
Sevin	Carbaryl
Sulfur	Sulfur
Temik	Aldicard

D. Soybeans

Insecticides recommended for spraying soybeans are on the following lists.

ORGANOPHOSPHOROUS COMPOUNDS	OTHER COMPOUNDS
Carbophenothion	Carbaryl
Garrathion	Sevin
Trithion	Toxaphene
Parathion	
Alkron	
Niran	
Stathion	
Thiophos	
Azinphosemethyl	
Guthion	
Malathion	

2.3 Field Re-entry After Spraying

You are not to enter any field within 24 hours after spraying or dusting with any pesticide. You may not enter any field within 72 hours after it is sprayed with an organophosphorous compound. This means that you may have to skip periodic observations in some fields from time to time because it is not safe to enter these fields. Periodic observations may be delayed up to 2 days beyond the scheduled date because of spraying. If a longer delay is warranted, contact your State Supervisor for concurrence.

2.4 Protective Clothing to be Worn

All Crops:

You must wear a long sleeved shirt, long trousers and head covering when working in fields that have had organophosphorous insecticides applied within the past 30 days. Clothing exposed to organophosphorous residues should not be worn more than one day. Care should be taken in storing and laundering such clothing to avoid possible contamination of other clothing. In fields which have had organophosphorous insecticides applications must be entered when plant foliage is wet, water resistant or waterproof protective gear (boots, raincoat, etc.) should be worn to prevent absorption of insecticides.

2.5 Soap and Water Decontamination

All Crops;

Each enumerator must carry water and regular bath soap when work is to be done in fields that have had organophosphorous insecticides applied. Upon completion of work in each field that has been treated with an organophosphorous insecticide, thoroughly wash all exposed skin areas (hands, face) that may have contacted plant foliage.

2.6 Cholinesterase Determinations (Cotton Enumerators Only)

Cotton:

Since organophosphorous insecticides are used intensively on cotton, all employees who regularly enter cotton fields are required to obtain a blood test(s) to determine cholinesterase levels. These test(s) will provide maximum protection for your health. Cholinesterase is an enzyme in the blood which is adversely affected by organophosphorous insecticides. If your level of this enzyme is abnormally low, contact with organophosphorous compounds could be hazardous to your health.

All cotton enumerators who were tested in 1980 will take one pre-exposure test in 1981, not more than 40 days before survey work begins. New enumerators will be required to take two tests. An enumerator is not required to have a blood cholinesterase test after the pre-exposure test(s) except:

(1) If the enumerator's two pre-exposure tests are below normal limits and a field sprayed with organophosphrous compounds was entered within the last month.

(2) If an enumerator spent 30 or more hours per month in fields sprayed with organophosphorous compounds.

(3) If an enumerator stays within all the limits described, yet feels it desirable to have a blood test, the agency will cover the cost.

Any person with an extremely low cholinesterase level will not be permitted to work the ground data survey until after January 1, 1982 and that person has been retested and the cholinesterase level is acceptable. Even limited exposure to organophosphorous insecticides could be hazardous with an extremely low cholinesterase level.

The test should be obtained not later than 24 hours after completion of scheduled periodic field observations. Your SSO will provide you with information on obtaining the blood test. You may have to go to a medical facility to have the blood drawn which will then be shipped to a centralized lab. The analyzing laboratory may use the reporting form provided by the State Office or their own form. Instruct the medical facility to record the test results and the normal range for the test and mail one copy to you and one copy to the State Office. Window envelopes will be provided for this purpose. Before the tests are completed, you should enter your name and the address of the medical facility on each reporting form. Also, enter your name and address on the copy of the form which is to be mailed to you.

Form ADM-008 should reflect time and mileage incurred to secure each test. Reimbursement for the medical facility test fees should be claimed in the "other expenses" column of Form ADM-009. You must submit a paid receipt to support this claim.

On the day that each test is obtained, report to the State Office all exposure to insecticides on the form provided for this purpose. These data will enable us to better analyze the blood cholinesterase monitoring system as a pesticide safety precaution. Exposure to be reported would be use or handling of pesticides or coming in physical contact with any surface area which has been treated with insecticides. Report one of the following categories:

a. NONE - No exposure to insecticides in past 30 days other than during enumeration or objective yield work.

b. LIGHT - Exposed to insecticides 1 or 2 days in past 30 days other than enumeration or objective yield work.

c. MODERATE - Exposed to insecticides 3-7 days in past 30 days other than enumeration or objective yield work.

d. HEAVY - Exposed to insecticides more than 7 days in past 30 days other than enumerative and objective yield work.

2.7 Physical Symptoms of Overexposure

All Crops:

The signs of pesticide poisoning may resemble fatique or other common symptoms of illness. However, you can protect yourself by knowing and being alert to the early warning signs of poisoning.

Look for any or all of these signs of sickness, but do not diagnose yourself -- GO TO YOUR DOCTOR.

SYMPTOMS

Headaches - dizzy spells - nervousness - sudden weakness - sick stomach - cramps - vomiting - diarrhea - heavy sweating - watery eyes - salivating - skin rash - breathing difficulty - fits - coma - pupils of the eye reduced in size.

2.8 Medical Attention

All Crops:

Go to the nearest qualified physician if poisoning symptoms appear. Explain your symptoms to your doctor and tell him you have been working in fields where insecticides may have been applied. Use your Form B's or kit envelopes to determine the names of insecticides applied to fields where you have recently worked. Give this information to the doctor. Notify your State Supervisor immediately. Do not return to work on the Ground Data Survey unless you receive the doctor's permission and the State Supervisor is notified.

Whenever medical attention is required NOTIFY your State Supervisor immediately.

3.1 General

Because of costs and other limiting factors, periodic observation of crop development will be done in only 50 percent of the segments included in the survey. Therefore, your segment may not be selected for periodic observation. However, land use inventories will be needed for all segments. Procedures for completion of the land use inventory are covered in Section 4 of the manual.

You will be given a segment kit at the State training school if your segment requires periodic observation. This kit will contain the maps, photos and forms needed to complete the observations. Maps, photos and pens needed to complete land use inventories will be mailed to you in a separate kit between May 1 and May 15 for winter grain segments and between August 1 and August 15 for all other segments.

Rain gauges will be used again this year. These will be placed in farmer's yards where the farmer or a member of the family will agree to record daily precipitation. Gauges will be used only in segments where periodic observations are being made. Instruction for distribution of gauges and collection of forms are given in Section 3.7.

If you have been assigned a segment designated for periodic observation, the segment kit will contain a slip of paper showing the date when selection of fields for periodic observation may begin. Do not begin work in the segment before this starting date.

The general sequence of events for completing periodic observations is as follows:

A. Using the map and aerial photograph, drive to the area outlined on the country map and locate the segment.

B. Select and identify on your aerial photograph fields to be observed throughout the summer. (See Section 3.2 for procedure.)

C. Complete Form A: Initial Interview (Section 3.3 gives instructions).

D. Set out rain gauges (Section 3.7 gives instructions).

E. Complete Form B: Periodic Observation on the next scheduled observation date and on each scheduled date thereafter until all fields selected have been harvested or until your calendar expires. (Section 3.4 gives instructions). All calendars expire on or before November 1. Periodic observations can begin even if you have not selected all the fields to be observed.

F. Collect rain gauge forms each month during segment visits.

G. Complete Form C: Final Interview for each selected field as it is harvested (Section 3.5 gives instructions).

Even though the land use inventory will be done during August and September for most segments, you can get a head start by recording crop or land use codes on your aerial photo for every planted field, permanent pasture, woodland area, pond, and non-agricultural area, while you are selecting fields for periodic observations. You will be able to more nearly complete the inventory by observation shortly after planting than if you delay starting until August.

3.2 Selecting Fields for Periodic Observation

Field selection procedures for the two super segments (one in Iowa and one in North Dakota and for the 12 SEA/AR segments are covered in Sections 5 and 6, respectively.

Kits for segments selected for periodic observation will contain an aerial photograph where up to 60 points within the segment boundaries have been numbered. These points were assigned on a probability basis so that each field in the segment had an equal chance of selection. The numbers assigned to points represent the sequence in which they were selected. This accounts for the rather random appearance of the numbers. The aerial photograph is for your use but will be returned to the State Office at the end of the survey. (See Appendix C-1, Sample Site with Random Points).

Using the map and photo, plan a course of travel that will allow you to canvass the first 30 points during one orderly trip through the segment. The sequence in which you visit these 30 fields is not important.

Drive to your segment and begin canvassing the 30 points by following the travel plan you laid out. Select only those fields containing the numbered point for observation that meet the selection requirements. When a field is selected, draw field boundaries on the photograph. If the point falls on the boundary of more than one field that meets selection criteria, select the field which contains largest portion of sample point. If only one field qualifies, select it for observation. Contact operators of these fields as you select them in order to get permission to observe the fields and to get the information needed to complete Form A. (Instructions are in Section 3.3). You will need to be setting out rain gauges as you meet the operators. (Instructions are in Section 3.7).

After you have canvassed the first 30 points or fields, you may find that you were not able to select all of them for observation. For example, suppose you were able to select only 23 fields. You will need to select 7 more fields in order to meet the requirement of 30 fields. Locate points 31-37 on your photo, plan a course of travel, and canvass these fields. Repeat this process until you have either selected the required number of fields or have canvassed all the numbered points.

While you are canvassing your segment to select fields for periodic observation, record on the photo the crop or land use code for each planted field you visit even if you didn't select it for observation. This information will be needed later when you complete the land use inventory.

Criteria for Field Selection: There are four criteria that must be met before a field can be selected for periodic observation. They are:

1. Must be planted to one of the following crops:

Barley	Corn	Cotton
Rice	Sorghum	Soybeans
Sunflowers	Wheat	Oats
Rye		

Fields not yet planted should not be selected unless all 60 points have been used and fewer than 30 fields have been selected. Select Idle field only if farmer intends to plant one of the crops before July 15.

2. Must be the proper size:

Generally, fields that contain 25 acres or more are eligible for selection. The analysts at Johnson Space Center tried to place the 60 numbered points in fields containing forty acres or more. Boundary changes or errors in photo interpretation may have caused ineligible fields to be numbered. Two adjacent fields planted to the same crop at about the same time and separated by a non-tilled area no more than 20 feet wide may be combined to meet the size requirement. Do not select fields less than 60 yards wide on the shortest side.

3. Must be Accessible by Auto

Selected fields need not be adjacent to public roads in order to meet this requirement. However, you must be able to reach the field with a standard automobile within four days after a normal rain. If access is by private road or across private land, you must get permission to use the road or drive across the land in order to select the field.

4. Permission of the Operator

The operator of the field must agree to allow observation of the field. The operator should be aware that you will enter the field several times to make your observations.

SECTION 3
COLLECTING PERIODIC CROP
DEVELOPMENT DATA

Selection of replacement fields for periodic observation may be necessary for a variety of reasons. Fields that were thought to contain a crop of interest but turn out to contain some other crop must be replaced. Withdrawal of operator permission will also make replacement necessary. Replacement fields should not be selected after July 25 even though it may become necessary to stop observation of the original field because it ceases to meet the criteria for selection. Replacements will not be selected for fields that are harvested; if a second crop of interest is planted to these fields, you should complete Form A and continue to monitor the second crop. Replacements must be selected from the fields numbered at Johnson Space Center. The replacement search will begin with the next field not canvassed during earlier selection procedures. When all 60 points have been exhausted, no additional fields are to be selected.

Your segment kit contains a schedule showing the days that you must visit the fields you have selected in order to complete Form B: Periodic Observation. (Instructions in Section 3.4). If a scheduled observation day occurs before you are able to select the required number of fields, complete the observations for the fields already selected, and return the completed Form B's to your State Office. Then continue with the field selection process. You should be able to complete selection of the 30 fields in a week or less depending on the location of your segment.

3.3 Completing Form A: Initial Interview

As you select fields for periodic observation, contact the operators of these fields to complete Form A, and secure permission to enter these fields.

Operators may have questions about what you are doing and how it fits in with crop estimation by remote sensing. Explain the purpose of the survey using information in Section 1.1 as a guide. If you are unable to answer a question, make a note of it on a Form D so the State Office can provide the information. Tell the operator you are in the process of selecting fields for observation throughout the summer and that you will be visiting these fields every 9 or 18 days. Explain that you are selecting fields representing all yield potentials from good to poor. Be sure the operator understands that the questions you ask about pesticide applications are to insure your personal safety. In short, establish the best possible rapport because you need the operator's consent and cooperation to do a good job.

Field Numbers: Complete one line on Form A for each field you select for observation. Use the field number from the photograph to indicate which fields you selected. It is extremely important that you maintain constant correspondence between field numbers recorded on the photo and those you record on the survey forms so there is no confusion about which fields are being observed. Field numbers do not have to be recorded in sequence on the survey forms.

Crop Code: Identify the crop type using codes provided in Section 3.4.2. The code you enter must be for one of the crops of interest to the study.

Acres Planted: Record actual acres planted to the crop, not the total acres in the field. Round reports given in tenths of acres to the nearest whole acre. Be sure the operator understands that you are interested in planted acres.

Planting Date: Record the month and day when 50 percent of the field was seeded (May 8 would be recorded as 0508). This should cause few problems since most fields are seeded in one or two days. When seeding was delayed for a week or more by rain, the operator will have some difficulty providing the correct date. Probe for his/her best estimate. If fields had to be reseeded in order to get the desired stand, use the second seeding as the basis for recording the seeding date.

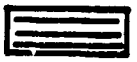
Emergence Date: The guidelines are the same as for planting date, but the operator may have a more difficult time providing this information. We want the best possible estimate of the day when half the stand was emerged. (June 3 would be recorded 0603).

Seeding Rate - Unit: Seeding rates for most crops will be reported in pounds per acre. Enter the actual whole pounds in the Rate per Acre Column and a "1" in the unit column. If the operator reports in kernels or seeds per acre, record the response under Rate Per Acre and a "2" in the unit column.

Previous Use: This column is for reporting the crop grown or land use during the last crop season. Use the crop codes shown in Section 3.4.2. In double or continuous cropping areas, record the code for the last crop harvested.

Irrigation: If the field is to be irrigated by any method enter a "2". Partially irrigated fields should be shown as irrigated (Code 2). Enter "1" only for those fields where no irrigation is planned.

Row Direction: Below are the codes for recording row direction. Operator reports should be verified by field observation. Record the predominant row direction.

Code	Description	Diagram
NS	North - South	
EW	East - West	
NW	Northwest - Southeast	
NE	Northeast - Southwest	
CL	Circle	
RS	Round-the-Square	
CN	Contour	
BC	Broadcast	

Row Width: Most operators can tell you what the row width is unless the crop was broadcast. Record the width is whole inches. Verify the spacing by field measurement. Enter zero for broadcast crops. Do not include the skipped row for fields planted using the skip-row technique.

Pesticides: Be sure to ask about the use of pesticides if the field contains cotton, corn, or soybeans (Section 2 explains the pesticide safety program). If the operator is undecided about the use of pesticides, enter "1" for Yes and check back before making periodic observations. If no pesticide applications are expected enter "2" for No.

Variety: This column is for recording the variety of the crop planted. Enter the standard trade name, or the alpha numeric name most common to the area.

Operator Name: Be sure to record operators' names for fields selected for observation. These names will be useful if you must contact the operator again about use of organophosphorous pesticides and for helping remember who to contact at the end of the season for information needed to complete Form C: Final Interview.

Mailing Instructions: Before mailing Form A to the State Office, complete the following steps:

(a) Be sure all entries are legible and that you have not forgotten to enter the field numbers and crop codes for all fields.

(b) Record the date of the initial interview on top of Form A.

(c) Record State name, county name, state code, and segment number in the boxes provided.

(d) Attach a Form D if you have comments about any fields.

(e) Keep one copy of Form A for your records.

Due Date: Form A is due in the State Office as soon as you complete it, but no later than August 1.

In areas where two or more crops are grown during one season, you may need to complete a second Form A when the first crop is harvested and the selected field is seeded to a second crop of interest. Continue your periodic observations of these fields until they are harvested or until your observation calendar expires. If a second Form A is needed because of double cropping, it will be due in the State Office by September 1.

3.4 Completing Form B: Periodic Observations

3.4.1 General Procedures

Observation Calendar: Your segment kit will contain a calendar specifying dates selected fields will be visited in order to complete Form B. Periodic Observations. You should complete the required entries for each field selected; each Form B has space for up to fifteen fields. For each segment this will require two Form Bs to be completed and returned to your State Office for each scheduled observation date.

Dates on the periodic observation calendar correspond to days when one or both of the two Landsat Satellites will be passing over the segment. Many segments are within range of the satellite's scanners on two consecutive days during each orbit cycle. These will appear on the calendars as scheduled segment visits, two consecutive days, followed by a lapse of 8 or 17 days. In this case you may schedule your visit on either of the two days the segment is within range of the satellite scanners. However, you should attempt to complete scheduled observations in all selected fields in one day. Study the calendar in your segment to determine if you are required to complete a Periodic Observation Form every 9 days or every 18 days. Contact your State Supervisor if you are unsure.

Enumerators are not required to work on Sundays in order to complete periodic crop development observations. Crop development observations should be made on Saturday or Monday when the scheduled date is on a Sunday.

Periodic crop development observations may be delayed up to two days beyond the scheduled date because of severe weather conditions in the segment. If a longer delay appears warranted, contact your State Supervisor for concurrance.

Below is a sample periodic observation schedule for a segment requiring visits every 18 days:

SEGMENT OBSERVATION SCHEDULE

STATE = 1 SEGMENT = 310

COUNTY = MADISON

LATITUDE = N034/54 LONGITUDE = W086/33

MONTH	DAY	YEAR
5	16	1981
5	17	1981
6	3	1981
6	4	1981
6	21	1981
6	22	1981
7	9	1981
7	10	1981
7	27	1981
7	28	1981
8	14	1981
8	15	1981
9	1	1981
9	2	1981
9	19	1981
9	20	1981
10	7	1981
10	8	1981
10	25	1981
10	26	1981

Pesticides Applications: Before entering any field containing cotton, corn, or soybeans, contact the owner/operator to determine if an organophosphorus pesticide has been applied since your last visit (refer to Section 2). If the answer is yes and the application was within 72 hours prior to your visit, enter the Field Number, Crop Code, Code "1" (Yes) under Pesticide Applied, and skip all observation of that field until the next scheduled observation date.

Idle Fields: Some fields may have been idle when selected, (See Section 3.2). These fields do not require periodic observation until a crop has emerged. For these fields, enter the Field Number, Crop Code "IL" (Idle Land) and code Canopy Height "99". The field should be dropped if a crop of interest was not planted by July 15. Treat fields planted to a crop of interest that has not emerged as an idle field.

Making and Recording Field Observations: Periodic field observations are made primarily to provide: (1) Input for developing crop calendars, and (2) Representative measurements of specified characteristics within selected fields to assist in developing techniques for interpreting Landsat Images. Field observations recorded on Form B should be as accurate as possible, and represent general field conditions rather than conditions at any specific location within the field.

To collect the required observation data, enter the selected field from corner most accessible by auto, attach a flagging ribbon at starting corner. Walk 50 paces across end of the rows and attach flagging ribbon at end of the row, turn and walk 75 paces into the field and attach flagging ribbon. When you arrive at this point, record general or representative observations made from the time you entered the field until you arrived at the 50 x 75 paces point. (For rice you should observe and make all measurements from the levee at 50 paces from entry corner. Do not enter the field.)

Field Numbers: All periodic field numbers must be the same as those indicated on the random field selection photo, and recorded on Form A. This field number should be used throughout the growing season.

Crop Identification Codes: These land use codes are to be used for crop designations on all forms and on the photo overlay for segment inventory. Specific problems that might arise concerning crop identification or other land use designations are discussed under Land Use Inventory (Section 4). See Section 3.4.2 for the appropriate Crop Identification Code.

> Prior to entering the field, record the Field Number and Crop Type on Form B. All measurements and observations must be representative observations within each field.

Canopy Height: Measure five representative plants of the field in route to the 50 x 75 pace point and record their average height in whole inches. This measurement is from the row middles to the highest point of the standing plant. Be careful not to extend the plant for these measurements. For some crops, this measurement may decrease from one periodic observation to another, particularly during the maturity stage. Continue to measure canopy height until the crop reaches 6 feet or more. When this occurs, enter Code "99" for canopy height on Form B.

Ground Cover: The Ground Cover Percent entered on Form B should be representative of the entire field. Make several observations enroute to the 50 x 75 pace point, then record the percentage that best represents the field. The ground cover measurement is taken by looking straight down at an area encompassing at least 2 square yards and estimating the percent of soil surface background that is covered by vegetation (crop and weeds). Select the ground cover code which corresponds to your estimate and enter it on Form B. See Appendix A for sample illustrations of ground cover. Ground cover observations will be made until the plant reaches a height where it is not possible to view the ground area by looking down from above the plant canopy. In this case, enter code 11 on Form B.

CODE	GROUND COVER PERCENT
1	0-10
2	11-20
3	21-30
4	31-40
5	41-50
6	51-60
7	61-70
8	71-80
9	81-90
10	Over 90
11	Not Observed

Canopy Color: For remote sensing research, the color, vigor, and amount of living tissue associated with the crop in the field is very important and influences the values of satellite data. Record the proportion of the total plant material that is green. Canopy Color should represent entire field. Make this determination based on observation enroute to 50 x 75 pace point. Select the appropriate code below that best describes the greenness at your location and enter it on Form B.

CODE	CONDITION	DESCRIPTION
1	Green tint appearance	Nearly 100% of leaves & stems are green.
2	Mostly green appearance	25% of leaves turning yellow or brown, mostly lower leaves.
3	Upper plant growth green appearance	About 50% of leaves & stems turning yellow or brown.
4	Slight green appearance	About 75% of leaves & stems turning yellow or brown or falling off.
5	No green appearance	Entire plant yellow or brown with leaves dying and falling off. Result of very heavy stress or natural drying up of crop at end of sector.
6	Not observed	

Crop Growth Stages: All normal plants will follow a general pattern of development, but the specific times between stages and numbers of leaves may vary between different varieties and hybrids, different planting dates, and different locations. Stage of development for a field should be representative of plants observed while entering the field.

Crop growth stage codes were developed to allow reporting of distinct growth stages. A field is considered to be at a particular growth stage when half (50% percent) of the plants are estimated to have reached the described development stage.

The growth stage should be determined by referring to the appropriate crop development stage and comparing the description with the plants being observed. You should determine which stage best describes the crop development and record the appropriate code on Form B. See Section 3.4.3 for Crop Growth Stage Codes and Appendix B for illustrations of selected growth stages.

When the selected field has been harvested, record method of harvest and return Form B to the State Office. No further visits to the field are necessary unless a record crop of interest will be planted.

Surface Moisture: At several points enroute to the 50 x 75 pace point, feel the texture of the upper three inches of the soil surface, Rate moisture content for the field according to the code below that best describes the moisture condition.

CODE	CONDITION	DESCRIPTION
1	Dry	Soil contains little moisture, can be broken with some difficulty between thumb and fourfingers, breaks into powder or individual grains.
2	Moist	Soil contains some moisture, crushes easily under gentle pressure between thumb and fourfingers and can be pushed together into a lump.
3	Wet	Soil contains considerable moisture, readily deformed by moderate pressure and can be pushed into a lump, will form a wire when rolled between thumb and fourfingers, tends to stretch rather than pull free from other particles.
4	Saturated	Soil has water drippings, forms mud, does not form a lump when pressed, will not form a wire when rolled between thumb and fourfingers.
5	Standing water or irrigated	Water standing on surface of soil.
6	Not observed	

Weediness: For this evaluation, weeds are all plants other than the planted crop, for example, cocklebur and corn are both weeds in a soybean field. Estimate the percent of major weed(s) present in the field and record the appropriate code on Form B.

CODE	CONDITION	DESCRIPTION
1	None or few	Excellent weed control; weeds are not a problem in this field.
2	Light weediness	Good weed control; weeds make up 5 to 25% of all the plants in the field.
3	Moderate weediness	Weeds make up 25 to 50% of the plants in the field.
4	Heavy weediness	Weeds make up 50 to 75% of plants in the field.
5	Very heavy weediness	Very weedy; more than 75% of the plants in the field are weeds. Severe crop loss anticipated.
6	Not observed	

Disease Damage: Crop losses to disease may result from decreased photo-synthetic capacity, reduced plant populations, or decreased crop quality. Rate the effect of disease on the crop according to the scale below and record the code that best describes disease conditions. Record type of disease on Form D if disease is known.

CODE	CONDITION	DESCRIPTION
1	None or few	0 to 5% of the leaves or other plant parts affected.
2	Light infestation	5 to 25% of the leaves or other plant parts affected.
3	Moderate infestation	25 to 50% of the leaves or other plant parts affected.
4	Heavy	50 to 75% of the leaves or other plant parts affected.
5	Very Heavy	75 to 100% of the leaves or other plant parts affected. Premature plant death.
6	Not observed	

Insect Damage: Rate the insect damage according to the following rating scale which is based on the defoliation, but has been adapted for other damage. Record the code for your evaluation on Form B. Record type of insect causing damage on Form D if a code of 3 or greater is used.

CODE	CONDITION	DESCRIPTION
1	None or slight	No insect damage or less than 5% of leaves or other plant parts are damaged.
2	Light damage	5 to 25% of the leaves or other plant parts are damaged.
3	Moderate damage	25 to 50% of the leaves or other plant parts are damaged.
4	Heavy damage	50 to 75% of the leaves or other plant parts are damaged.
5	Very heavy damage	75 to 100% of the leaves or other plant parts are damaged. Premature death of plant and severe yield loss.
6	Not observed	

Hail Damage: The ability of the crop to recover from hail depends on severity of damage and stage of growth of the crop. For example, hail during the grain filling period is more devastating than hail during early growth. Hail damage usually results in defoliation and destruction of stems.

CODE	CONDITION	DESCRIPTION
1	None or slight	No damage or less than 5% of leaves are damaged.
2	Light damage	5 to 25% of leaves are missing; few main stems are broken.
3	Moderate damage	25 to 50% of leaves are missing; 5 to 50% of main stems are broken.
4	Heavy damage	50 to 75% of leaves are missing; 25 to 50% of main stems are broken.
5	Very heavy damage	75 to 100% of leaves are missing; more than 50% of stems are broken. Severe crop loss is anticipated.
6	Not observed	

Lodging Damage: Crop lodging is a condition when plants bend at or near the soil surface and lie more or less on the ground. Lodging is rated according to the angle formed by the main stem of the plant and the soil surface.

CODE	CONDITION	DESCRIPTION
1	None or slight	Most plants are nearly vertical, 0^{o}.
2	Light	Most plants are nearly 22^{o} from vertical.
3	Moderate	Most plants are halfway between vertical and flat on the ground, 45^{o}.
4	Severe	Most plants are nearly 70^{o} from vertical.
5	Very severe	Most plants are flat on the ground, 90^{o}.
6	Not observed	

Mailing Instructions: Before mailing Form B to the State Office complete the following steps:

(a) Be sure all entries are legible and that you have not forgotten to enter the correct codes for fields that were not observed.

(b) Record date observations were made as well as the corresponding satellite pass date from the segment calendar.

(c) Record state name, county name, state code, and segment number in the boxes provided.

(d) Attach a Form D if you have comments describing unusual cropping practices, abandonment, or other conditions affecting crop development. Be sure to record the field number and crop type to properly identify all your comments.

Due Date: Periodic Observation Forms must be mailed to the State Office as soon as they are completed. Your State Supervisor will be expecting these forms to arrive in the State Office within five days after each scheduled observation date.

3.4.2 CROP IDENTIFICATION CODES

CODE	CROP
AH	Alfalfa
BW	Buckwheat
BR	Barley
CL	Clover
CR	Corn
CT	Cotton
DB	Dry Bean
DW	Durum Wheat (if not sure, label as spring wheat)
FX	Flax
GS	Grasses (no visible signs of hay activities)
IL	Idle land, set aside, fallow, no visible current year cropping activities
ML	Millet
MU	Mustard
OA	Oats
OH	Other hay
OR	Orchard/vineyards, including tree farms
PA	Pasture, improved grasslands and fenced areas used exclusively for grazing
PE	Peanuts
PO	Potatoes
RA	Rape Seed
RI	Rice
RY	Rye
SB	Sugar beets
SC	Sugar cane
SF	Safflower
SO	Soybeans
SR	Sorghum
SU	Sunflower
SW	Spring Wheat
TB	Tobacco
TR	Trees, Woods, Brush
VE	Cucumbers, tomatoes, lettuce, sweet corn, onions
WA	Water - 5 acres
WW	Winter Wheat
XX	Non-ag. Includes homestead, ag buildings, towns, cities, roads, water < five acres, urban areas, mountains, deserts, marshes, swamp, quarries, etc.

ADDITIONAL CODES

A	Crop Abandoned
G	Grains grazed off
R	Previous year residue/stubble
V	Volunteer previous year crop
M	Mixed crop in field

3.4.3 CROP GROWTH STAGES CODES

3.4.3.1 Barley, Oats, Wheat and Rye Crop Growth Stages

CODE	STAGE
	PLANT EMERGENCE AND TILLERING
10	Undetermined; plant emergence and tillering substage not detectable.
11	Emergence from soil, single shoot.
12	Primary leaf stage, from two-five leaves.
13	Early tillering, one-two tillers visible.
14	Full tillering, three or more tillers visible.
	VEGETATIVE GROWTH
20	Undetermined; vegetative growth substage not detectable.
21	First node of stem visible at base of shoot.
22	Second node on stem visible.
23	Last leaf visible, flag leaf, but still rolled as it emerges from last sheath.
24	Early to mid boot, leaf sheath swollen.
25	Mid to late boot, leaf sheath swollen, tip of head may be visible.
	HEADING AND FLOWERING
30	Undetermined; heading and flowering substage not detectable.
31	Early heading, heads just visible as they push out of split in sheath of flag leaf.
32	Heading complete, all of head emerged from sheath.
33	Flowering, stem fully elongated and yellow antlers visible on outside of heads.
34	Kernels formed, kernels visible in head but are very tender and watery.
	RIPENING AND SEED DEVELOPMENT
40	Undetermined; ripening and seed development substage not detectable.
41	Milk Stage, contents of kernels like heavy cream.
42	Soft Dough Stage, contents of kernel soft but becoming dry.
43	Hard Dough Stage, kernel may be dented with fingernail with difficulty.
	MATURITY
50	Undetermined; maturity substage not detectable.
51	Ripe for cutting, kernel at hard dough stage but straw not completely dead.
52	Ripe for cutting, kernel at hard dough stage and straw completely dead.
53	Post ripe stage, crop still standing, becoming darker in color.
	HARVEST
60	Undetermined; harvest substage not detectable.
61	Crop harvested by combine; straw and stubble on surface.
62	Crop harvested by combine; straw raked, stacked, baled, and removed from soil surface.
63	Crop windrowed or swathed, not yet threshed.
64	Crop windrowed or swathed, followed by threshing with combine, straw and stubble on soil surface.
65	Crop windrowed or swathed, followed by threshing with combine, straw raked, stacked, or baled and removed from soil surface.

3.4.3.2 Corn Growth Stages

CODE	STAGE
	PLANT EMERGENCE
10	Undetermined; plant emergence substage not detectable.
11	Plant emergence; tip of coleoptile visible above soil surface.
12	One or two leaves fully emerged from coleoptile.
	VEGETATIVE GROWTH
20	Undetermined; vegetative substage not detectable.
21	Three-four leaves emerged.
22	Five-eight leaves fully emerged.
23	Nine-twelve leaves fully emerged.
24	Thirteen-sixteen leaves fully emerged; lower four-five leaves perhaps lost leaving eight-nine functional leaves; tassel developed but still enclosed within whorl; brace roots from lower nodes are now developing.
25	Seventeen-twenty leaves fully emerged.
26	More than twenty leaves fully emerged.
	HEADING AND FLOWERING
30	Undetermined; heading and flowering substage not detectable.
31	Tips of tassels visible from whorl of leaves.
32	Tassels fully emerging; all leaves fully emerged; some silks starting to emerge from tip of husks.
33	Silks nearly fully emerged; pollen shedding.
	RIPENING AND SEED DEVELOPMENT
40	Undetermined; ripening and seed development substage not detectable.
41	Kernels in blister stage; cob, husks, and ear shank approaching full size; about twelve days after silking.
42	Soft dough or just past "roasting ear" stage; about twenty-four days after silking.
43	Beginning dent stage; a few kernels showing dents about thirty-six days after silking.
44	Full dent stage; all kernels fully dented but not dry; husks on ear and leaves starting to senesce.
	MATURITY
50	Undetermined; maturity substage not detectable.
51	Physiological maturity; about sixty days after silking; black layer formed at base of most kernels; some of remaining leaves still green.
52	Physiological maturity; black layer formed; leaves dried up and bright yellow.
53	Post maturity; crop still standing with leaves, stalks, and ear husks turning dark color.
	HARVEST
60	Undetermined; harvest substage not detectable.
61	Crop harvested green before full maturity for use as silage.
62	Crop harvested for grain with corn picker; ear only removed and plants still partially standing.
63	Crop harvested for grain with combine; plants reduced to stubble and residue.
64	Ear and entire plant removed; very little residue on soil surface.

3.4.3.3 Cotton Growth Stages

CODE	STAGE
	PLANT EMERGENCE
10	Undetermined; emergence substage not detectable.
11	Seedling emerged; only two cotyledons present above soil surface.
12	First true leaf; single pair of true leaves present above cotyledons.
	VEGETATIVE GROWTH
20	No specific stages; general vegetative growth, branching and development of stems and leaves may cover a period of fifteen to sixty days after emergence.
	FLOWERING
30	Undetermined; flowering substage not detectable.
31	Appearance of first flower bud squares with discernable tracts.
32	First blooms open.
33	Appearance of green bolls over two inches long; squares and open flowers also present.
	RIPENING AND SEED DEVELOPMENT
	This general stage for cotton reported under Flowering and Maturity Stage.
	FLOWERING AND MATURITY
50	Undetermined; flowering and maturity substage not detectable.
51	First bolls split; squares, flowers, and green bolls usually present at same time.
52	All bolls split; plants remain mostly green.
53	All bolls split; plants defoliated or killed by frost.
	HARVEST
60	Undetermined; harvest substage not detectable.
61	Harvested by mechanical picker; crop not defoliated.
62	Harvested by mechanical picker after defoliation.
63	Harvested by stripper picker; crop not defoliated.
64	Harvested by stripper picker after defoliation.
65	Harvested by stripper picker; frost allowed to kill plant.

3.4.3.4 Rice Growth Stages

CODE	STAGE
	PLANT EMERGENCE AND TILLERING
10	Undetermined; plant emergence and tillering substage not detectable.
11	Emergence from soil; visible.
12	Primary leaf stage; two to four leaves.
13	Active tillering; one to four tillers per plant.
14	Full tillering; secondary and tertiary tillers now present; first tillers from main stem now have tillers of their own.
	VEGETATIVE GROWTH AND BOOTING
20	Undetermined; vegetative growth and booting substage not detectable.
21	Uppermost leaf; flag leaf clearly visible.
22	Head development inside flag leaf sheath; boot stage.
23	Early heading; tips of head becoming visible above sheath of flag leaf.
	HEADING AND FLOWERING
30	Undetermined; heading and flowering substage not detectable.
31	Heading complete; all of heads emerged from sheath of flag leaf.
32	Flowering initiated; spikelets at tip of head starting to flower.
33	Flowering completed; spikelets at lower portion of head completed.
	RIPENING AND SEED DEVELOPMENT
40	Undetermined; ripening and seed development substage not detectable.
41	Kernels formed but still tender and watery.
42	Milk stage; contents of kernels like milk.
43	Soft dough stage; contents of kernels soft but becoming dry.
44	Hard dough stage; contents of kernels may be dented with fingernail with difficulty.
	MATURITY
50	Undetermined; maturity substage not detectable.
51	Ripe for cutting; kernel at hard dough stage but straw not completely dead.
52	Ripe for cutting; straw completely dead.
53	Post ripe stage; crop still standing but not yet harvested; leaves and stems becoming darker in color.
	HARVEST
60	Undetermined; harvest substage not detectable.
61	Crop harvested by combine; straw and stubble on surface.
62	Crop harvested by combine; straw raked, stacked, baled, removed from soil surface.
63	Crop prepared for second harvest by flooding.

NOTE: If a second harvest is intended, continue to monitor field. Second rice crop would begin with Stage 22 or 23 under Vegetative Growth and Booting.

3.4.3.5 Sorghum Growth Stages

CODE	STAGE
	PLANT EMERGENCE
10	Undetermined; plant emergence substage not detectable.
11	Emergence; tip of coleoptile visible above soil surface.
12	One or two leaves fully emerged from primary shoot.
	VEGETATIVE GROWTH
20	Undetermined; vegetative growth substage not detectable.
21	Three leaf stage; collar of three leaves visible without pulling leaves apart, about ten-twenty days after emergence.
22	Five-ten leaf stage; twenty-thirty days after emergence, lower leaves beginning to be lost.
23	Flag leaf stage; flag leaf, final top leaf, is visible in whorl of leaves. The final three-four leaves not fully extended out of whorl. Some lower leaves lost.
	HEADING AND FLOWERING
30	Undetermined; heading and flowering substage not detectable.
31	Boot Stage; all leaves fully expanded, head well developed and enclosed in flag leaf sheath.
32	Bloom head fully emerged from flag leaf sheath, flowering in progress from tip of head downward in 1/2 of the heads of the field.
	SEED DEVELOPMENT
40	Undetermined; seed development substage not detectable.
41	Soft Dough; seed contents soft and beginning to dry.
42	Hard Dough; seed contents dry and difficult to dent with fingernail.
	MATURITY
50	Undetermined; maturity substage not detectable.
51	Physiological Maturity; seed at hard dough stage or dryer; remaining leaves on plant stay green.
52	Physiological Maturity; seed at hard dough stage or dryer; remaining leaves of plant dying and turning brown.
53	Post Maturity to Crop Mature; remains standing in field with leaves, stems, and heads dying or dead and turning dark color.
	HARVEST
60	Undetermined; harvest substage not detectable.
61	Crop harvested, combined; remaining stubble and leaves still green, crop residue from combine still on soil surface.
62	Crop harvested; remaining stubble, leaves dead and brown color; crop residue on soil surface.

3.4.3.6 Sunflowers Growth Stages

CODE	STAGE
	PLANT EMERGENCE
10	Undetermined; plant emergence substage not detectable.
11	Cotyledons emerged above soil surface.
12	First pair of opposite leaves formed.
13	Second pair of opposite leaves formed.
14	Extra leaves or leaf pairs beyond second or third pair possible, usually there are many alternate leaves formed in the vegetative stage.
	VEGETATIVE GROWTH
20	Undetermined; vegetative growth substage not detectable.
21	Development of first leaf that starts spiral arrangement of leaves around main stem. There is one leaf per node and together the leaves form a spiral around the stem from bottom to top.
22	Second alternate leaf has formed.
23	Third alternate leaf has formed.
24	Extra leaves or leaf pairs beyond second or third number possible, usually there are many alternate leaves formed in the vegetative stage.
	HEADING
30	Undetermined; heading substage not detectable.
31	Flower head visible but still tightly surrounded by young leaves.
32	Flower head pushed above the crown or plate of leaves. A few young leaves are still indistinguishable from flower tracts.
33	Flower head fully extended above uppermost leaves. Last vegetative leaf on stem clearly distinguishable from flower tracts.
34	Flower begins to open and ray florets, petal-like flowers on rim of flower head, visible.
	FLOWERING AND SEED DEVELOPMENT
40	Undetermined; flowering and seed development substage not detectable.
41	Disk-flowers starting to shed pollen - Begins near outer part of head.
42	Pollen shedding complete for outer 1/2 of Disk flowers.
43	Pollen shedding complete; seed filling on outer florets starting.
	MATURITY
50	Undetermined; maturity substage not detectable.
51	Seed filling nearly complete, flower head completely inverted, plant losing lower leaves.
52	Floral cup and leafy tracts turning yellow, young leaves beginning to senesce.
53	Seed becoming hard and dry, stem and leaves dry and commercial, maturity complete.
	HARVEST
60	Undetermined; harvest substage not detectable.
61	Plants harvested with combine; some stalks and leaves remain green.
62	Plants harvested with combine; stalks, leaves, and plant residue dry and brown.

3.4.3.7 Soybeans Growth Stages

CODE	STAGE
	PLANT EMERGENCE
10	Undetermined; plant emergence substage not detectable.
11	Cotyledons emerged above soil surface.
12	First true leaf; appearance of two unifoliate (single leaflet) leaves above cotyledons.
	VEGETATIVE GROWTH
20	Undetermined; vegetative growth substage not detectable.
21	Plant has two or less nodes. If two nodes are present, one is at the unifoliate leaves and the second at the first trifoliate leaf.
22	Plant has three-four nodes on the main stem, each with fully developed leaves. Node at unifoliate leaves is counted as No. 1.
23	Plant has five or more nodes on main stem. Vegetative stages can continue for several weeks before entering reproductive stage.
	HEADING AND FLOWERING
30	Undetermined; heading and flowering substage not detectable.
31	One open flower at any node on the main stem.
32	Full bloom; open flower at one of the two uppermost nodes on main stem.
	RIPENING AND SEED DEVELOPMENT
40	Undetermined; ripening and seed development substage not detectable.
41	Pod, 1/4 inch long, at one of the four uppermost nodes on main stem with fully developed leaf.
42	Full pod; pod one inch long at one of the four uppermost nodes on main stem with fully developed leaf.
43	Beginning seed; seed bean 1/8 inch long in a pod at one of the four uppermost nodes on the main stem.
44	Full seed stage; seed fills the pod cavity at one of the four uppermost nodes on the main stem, bottom leaves starting to turn yellow.
	MATURITY
50	Undetermined; maturity substage not detectable.
51	Physiological maturity; leaves on plant should range from green at the top of the plant to yellow and falling off at the bottom; one yellow or brown pod with seeds completely yellow, free of green color, on the main stem.
52	Harvest maturity; 95% of pods are brown, most leaves have fallen from plant.
	HARVEST
60	Undetermined; harvest substage not detectable.
61	Crop harvested with combine; stubble and plant residue sufficient to cover soil surface.
62	Harvested with combine; soil surface exposed with small amount of stubble and residue.

3.5 Completing Form C: Final Interview

Form C: Final Interview, should be completed as soon as possible after periodic observation field is harvested. This form should be completed by interviewing the operator of the field. In segments where two or more different crops are being observed, these interviews may span a month or more because of differences in harvesting dates. Two lines on Form C should be completed for fields where double cropping is observed, one for each crop.

Field Number: This is the field number from the aerial photo that you are using to indicate which field is being observed. It is extremely important that you maintain correspondence between field numbers recorded on the photo and those you record on the survey forms so there is no confusion about which fields are being observed.

Crop Code: Enter the crop code for the crop you have been observing. These codes are listed in Section 3.4.2.

Contact Date: This is the date that you actually interview the operator of the field. Record month and day (August 7 would be entered as 0807).

Acres Harvested: Acres harvested should be recorded in whole acres. Significant differences between harvested acres and planted acres reported on Form A should be explained on a Form D to be attached to Form C.

Harvest Date: This is the date when 50 percent of the acreage was harvested. From your observations, you will have some knowledge when that point was reached if the operator is not sure. For cotton and rice, record the date the first harvest was completed if a second and third harvest was done. (September 24 would be entered as 0924).

Production: The form asks for both the yield per acre and the total production for the field. This gives both you and the operator a cross check to insure the accuracy of the report. Please record both the yield per acre and the total yield in the same units.

Since a variety of crops are being observed and area customs determine how yields are reported, enter the code from the following list that describes the units in which yield is being reported.

CODE	DESCRIPTION
1	Bushels including shelled corn
2	Bushels ear corn
3	Cwt. - Hundred weight
4	Pounds
5	Tons

Percent Moisture: If the operator knows the moisture content of the crop when it was harvested, record it to the nearest whole percent. When the operator is unsure or does not know, code this cell as "99". Operators will often know the moisture content because testers are becoming more easily afforded or because grain was delivered to the local elevator at harvest.

Harvest Method: Enter the code from the list below that best describes the method of harvest. If there is no code in the list which adequately describes the method used, enter the code for "other" and explain on Form D.

CODE	METHOD OF HARVEST
H1	Combined
H2	Mechanical Picker (Cotton or Corn)
H3	Windrow and Combine
H4	Mow, rake and bale
H5	Windrow and bale
H6	Windrow and chop
H7	Chop
H8	Pelletize
H9	Other (Explain on Form D)

Fertilizer: Two pairs of columns are provided for recording fertilizer applications. Each pair contains one column for the amount of fertilizer applied per acre and a second column for recording the chemical analysis of the fertilizer. Fertilizer applications are to be reported in pounds per acre. If the operator can only tell you how many tons were applied to the whole field, convert to pounds per acre by first multiplying total tons by 2000 and dividing this product by number of acres in the field. Record fertilizer applications in whole pounds.

The analysis column is for recording the percent nitrogen (N), percent phosphate (P_2O_5), and the percent potash (K_2O) contained in the fertilizer. Since the analysis refers to the weight of the nutrients expressed as a percent of the weight of total material (nutrients plus carrier materials), the sum of the analysis percentages cannot exceed 100 and rarely exceeds 80.

Some fertilizers are often referred to by a generic-like name. Some of these are:

Kinds	Analysis Percent N	P_2O_5	K_2O
Ammonium Nitrate	34	0	0
Anhydrous Ammonia	82	0	0
Urea	45	0	0
Superphospate	0	46	0

Fertilizer analyses are to be recorded in whole percentages and in the sequence shown.

Applications of natural fertilizers, such as manure, or trace elements, such as iron and lime, are not to be reported even though they enrich the soil and enhance plant development.

If the operator made more than two applications of fertilizer, record both the rate of application and the analysis of the third and later applications on a Form D.

If the operator has contracted for custom application and the carrier compound is not known, enter the pounds of N, P_2O_5 or K_2O applied per acre and code 99 for analysis percent.

In areas where double cropping is a usual practice, you must be sure that the operator is reporting only fertilizer applied specifically for the crop being observed. For winter wheat, include fertilizer applied since preparation of the field last fall until the wheat crop is harvested.

Second Crop: The purpose of this pair of columns is to determine if another crop is to be planted for harvest before the end of the year. If the answer is no, enter a "2" for NO in this column. In this case, no further periodic observation will be made for this field.

If the response is yes, enter a "1" for YES in this column, and the appropriate crop code from those listed in section 3.4.2 in the crop code column. If the crop is one of the crops of interest (see Section 3.3) you will continue observing the field every 9 or 18 days depending on the observation schedule for your segment. You will also have to complete another line on Form A: Initial Interview for this field as soon as the second crop is fully emerged. (Instructions are in Section 3.3). Another line on Form C: Final Interview will be completed if the second crop is harvested before December 15.

Mailing Instructions: Before mailing Form C to the State Office complete the following steps:

(a) Be sure all entries are legible and that you have not forgotten to complete the Second Crop intentions columns.

(b) If a second crop is intended to be harvested before the end of the year, you will need to complete another line on Form A, use the same field number, and continue to observe the field for periodic observations until November 1.

(c) Record State name, county name, state code and segment number in the boxes provided.

(d) Attach Form D if you have made comments explaining significant differences between planted and harvested acres, unusual harvest methods requiring code "H9", and additional applications of fertilizer.

Due Date: Form C should be sent to the State Office as soon as possible after all periodic observation fields have been harvested. In some areas, harvest does not occur until November or December. Since periodic observation of unharvested fields will end about November 1, visit your segment during the week of November 16-20 and, if necessary, during the week of December 14-18 to complete Form C for fields harvested after November 1. The final interview will not be completed for abandoned fields or those unharvested after December 15. Complete Form C during December for any cotton fields that have been picked at least once. Record the farmer's estimate of production for these unharvested fields. Indicate on a Form D that the field will be picked again.

3.6 Completing Form D

Due to the nature of the ground data survey and the dispersion of segment locations, it would be difficult to identify all crop conditions and cultural practices that could exist within your segment. Form D will be used for comments you feel are necessary to describe crop conditions, cultural practices, etc., that may affect crop development or the quality of the data being collected.

Comments: Good comments describing weather conditions and unusual tillage practices are necessary if the data user is to really understand the data you collect during periodic observations of fields in the segment. Comments may pertain to a specific field that you selected for observation, to a specific area within the segment or to the whole segment. Segment level comments are particularly useful because they extend the data collected from periodically observed fields to average conditions affecting the entire segment. Your opinion as to whether conditions are normal or abnormally good or bad are especially needed.

Completing Form D: If a comment refers to a field you selected for periodic observation, enter the field number and crop code. When the comment refers to a condition that is uniform over the segment (rain, hail, wind damage, flooding) enter "99" in both the field number and crop type cells. If the condition is affecting a particular crop within the segment (rust, mold, insects, blight) enter "99" for the field number, but enter the crop code for the affected crop.

New Crop Codes: Form D may also be used to convey new codes that you assigned because the code list in Section 3.4.2 did not contain a code for a crop that you found.

Specific Fields: Form D can also be used to comment on specific fields that were not selected for periodic observation. In order to do this, the field must be assigned a unique, 2-digit field number. However, do not use any number from 1 through 60 or 99, because they are reserved and have special meaning. If, for example, you wished to make special comments about a field of millet, the crop code printed on the aerial photo overlay might be ML/61. On Form D, you would write a comment for field number 61, crop code ML(See Section 3.4.2.).

Mailing Instructions: When mailing Form D, you must enter the State, county, segment, ID numbers, and completion date.

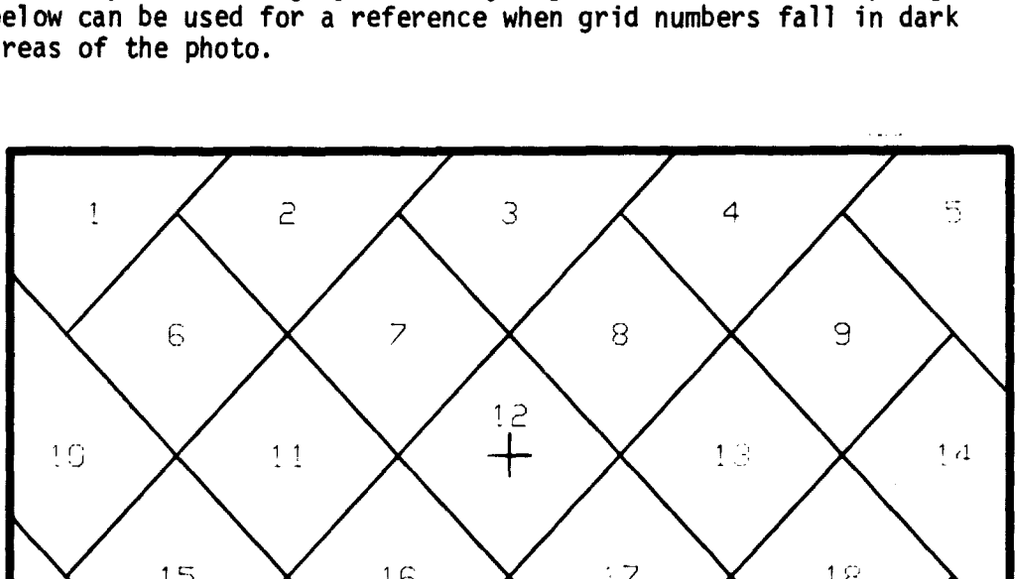
Due Date: All Form Ds are due at the scheduled mailing with other forms. At the end of the season, you may use Form D to relay your suggestions for methods that would improve the efficiency and/or effectiveness of the data collection process. Since this is an ongoing survey, your suggestions will be considered when procedures for next year's survey are being developed.

3.7 Placing Rain Gauges: Rain Gauges will be set out in all segments scheduled for periodic observation. Basically, the idea is to find cooperative farmers who will agree to read the gauges and record the rainfall on a daily basis. You will have to help the farmer place the gauge in a suitable location and you will have to pick up forms once each month beginning in June and ending in October. Up to 23 gauges will be set out in each of 60 segments scheduled for observation every 9 days. One gauge will be set out in each of the 18 day segments. Four gauges will be set out in each SEA/AR segment. Operators may keep the gauges at the end of the survey period.

Distributing Gauges within the Segment: Your segment kit will contain an aerial photograph of the segment. This photograph will have a pre-printed grid of 23 numbered squares. Only one gauge can be set out in the area represented by a grid square. It may not be possible to place a gauge in every square in the grid because there may not be a residence in each square. For the 18 day segments where only one gauge will be placed, it is more important to place gauge around edge of segment than in the middle. Our experience is that farmers or their spouse are usually agreeable to tending rain gauges, so you should not have trouble getting volunteers.

Setting Out a Gauge: When you find a volunteer, be sure you have not already set out a gauge in the square where the volunteer lives. Each volunteer you select will be given a gauge and one set of recording forms. After the gauge has been located, you should indicate its location on your copy of the photograph used in selecting 30 periodic fields. Indicate the location of the gauges on the photo by writing the number of the grid (1-23) over the location, then circle this number. This will provide you with a method for recording grids that have gauges placed in them.

Sample Grid: The black and white photo you have received will have many shades of gray from very light to dark. The sample grid below can be used for a reference when grid numbers fall in dark areas of the photo.



Gauge Number: Before giving the volunteer the forms, record the gauge number on each form. The gauge number is a 6 digit number constructed by combining segment number and the grid number where the gauge is to be located. The gauge number for a gauge located in segment 641, grid number 5, is 064105. Grid number 00 should be used for the 18 day segments where only one gauge is placed regardless of the location.

Placement of Gauges: Gauges should be placed on a fence post near the home of the volunteer so that it will be convenient for reading. The opening of the gauge should be above the top of the post and should be located some distance from buildings and large single trees. The distance from the rain gauge to the nearest building or single tree should be greater than one and one half times the height of the building or tree because storm winds swirling around these obstacles can disturb the accuracy of the gauge. Gauges can be located in an area of trees provided the gauge is not under a tree where moisture will drip from a tree into the gauge. You can place the gauge in a less than ideal location, but select the best location possible.

Recording Rainfall: Instructions for recording rainfall are on the back of each form. Spend some time going over them with the volunteer so that you can answer any questions. Each form has month, date and day pre-printed; be sure to instruct them to use the form with the current month. Your volunteers will be recording rainfall from May through September this year and may keep the gauge for cooperating.

You should make a list showing the gauge number and the name of the volunteer for each gauge you set out. Make a copy of the list and send it to your State Supervisor. This will help the supervisor if you should happen to send in some precipitation forms without a gauge number.

Collecting Forms: You will contact each of your volunteer rain gauge readers during your first scheduled periodic visit each month to pick up the recording forms for the previous month. Review each form you collect with the volunteer to be sure that it is complete and legible.

Mailing Instructions: Before mailing Form E to the State Office, complete the following steps:

(a) Review for legible entries, check for operator's name and date at bottom of form.

(b) Check all forms for same month code, which has been pre-printed.

(c) Review all entries that are reported with a minus sign (-). Valid entries in these cases are either a -6.00 (gauge runs over) or -.01 (gauge not read).

(d) Attach a Form D if you have made comments about the general weather condition during the past month. For segment level weather comments, record "99" for both field number and crop type.

Due Date: Form E is due in the State Office with Form B from your first scheduled periodic visit.

4.1 General

Because of cost and other limiting factors, land use inventories will only be required for those sites where 1981 High Altitude Color Infra-red Aircraft Photography has been acquired by July 15. Therefore, some enumerators assigned periodic field observation segments might not receive Land Use Inventory Kits from the State Office by August 15. No inventory will be done in these cases.

The Land Use Inventory Kit will contain two color infra-red photographs. These photos are produced with a high gloss finish, and are not easily drawn or written on, therefore, a frosted overlay will be used again this year. Since current year photography is being used for the inventory base, you are not required to outline all field boundaries. Use one of the photographs in the field as your working photo. The second should be kept at home to be used as the office copy.

Color Infra-red Photography: When you receive your segment kit, spend a little time studying the photography. The first thing you will note is that the photo is in infra-red color. This means that some colors will appear as you would expect while others do not. Clouds will appear as fluffy white puffs, their shadows - black. Both the clouds and their shadows block out ground features. Bodies of water are blue or black, while most buildings and roads appear white. Green vegetation will be red. A light blush of red shows when a crop is just emerging. As the crop covers more of the ground, the intensity of the red color increases. Remember, all green vegetation will appear red on the photo. The date the photography was acquired will appear on the lower right corner below the segment boundary (month/day/year).

4.2 Field Boundaries

You are not required to outline field boundaries on the photo overlay, except as follows:

(a) When there has been a change in field boundaries since the date of the photo. Example: A winter wheat field was abandoned and partially re-planted to barley; outline the boundary of each.

(b) When some fields were either not planted or emerged on the date of the photo. Example: A large fallow field was later planted half to corn and soybeans after July 15. You should outline the boundary of each crop.

(c) Large, continuous land areas that contain no cultivated crops can be outlined and coded as a separate field. You should indicate the crop code at several locations within these areas. Example: Town, trees, water, etc.

(d) Continuous strip farmed areas within the segment may be outlined as one field provided the strips are less than 60 yards wide and contains no more than two crops or land uses. Do not attempt to label each strip but record the codes for both crops or land uses within the field boundaries. Example: Alternating strips of winter wheat and fallow field.

(e) The thirty fields selected for periodic observation should be outlined on the photograph and numbered. This should be done immediately after the photo is received.

4.3 Assigning Crop Codes

Section 3.4.2 of this manual shows the crop codes to use when coding fields on the aerial photograph. During the time that you are completing the land use inventory, most crops will reach development stages where it will be fairly easy to differentiate one crop from another. Selection of the proper crop code from the list should not be difficult in most cases. Make sure to print the code within field boundaries on the photo overlay. Print the code carefully so that it is very legible and in the same direction every time.

The crop codes provided in Section 3.4.2 will be sufficient for coding the major crops grown in all areas of the United States. No codes are provided for specialized crops like hops, alfalfa seed, broom corn, turf grass, etc. If there are crops in your segment for which no code is provided, then you must assign a crop code. You may use any two-letter combination that has not been assigned to another crop. The following example illustrates the necessary steps for you to follow in assigning a new crop code.

EXAMPLE: Suppose that in the course of completing the land use inventory for your segment, you discover a field of hops. HP seems like a reasonable code for hops. Since that combination of letters has not been used for any other crop code, you decide that the code for hops in your segment will be HP. Print the code within the field boundaries on the photo overlay. On the photo overlay, outside the segment boundary, print HP = HOPS. Now, you must use Form D, the Comments Form, to indicate that you have assigned a new crop code. Under field number, enter 99 and under crop code enter HP. In the comments area enter "Crop code assigned for hops". Send the Form D in with the aerial photo when you complete the land use inventory. If additional fields of hops are found, code them HP.

Additional Codes: In Section 3.4.2, six codes under the heading ADDITIONAL CODES are shown. These are intended to be used in conjunction with the land use codes to describe special conditions. A field seeded to winter wheat and grazed off before harvest would be coded WW/G. A stand of volunteer winter wheat that is never harvested or plowed down would be coded WW/V/A. A seeded stand of mixed barley and oats where barley is the predominant crop would be coded BR/M. If neither crop predominates, designate one as the predominant crop.

4.4 Land Use Inventory

Completing the Land Use Inventory will require that you work with both photos. You will be using one in the field as a working copy, and the other at home as an office copy. The working copy will be for your use in completing the inventory, and the office copy will be for use by analysts at the Johnson Space Center. You will complete the Land Use Inventory on your working copy, and later that same day transfer all data to the office copy.

Working Photo: In order to complete the inventory, you will have to approach the task in a systematic fashion. One system might involve breaking the segment up into about six blocks of nearly equal size. You would then concentrate on completing one block before moving on to the next one.

Use the lead pencils provided in your segment kit to code fields on the photo overlay. Adjacent fields planted to the same crop at about the same time must be coded as two fields, even though no fences run through the parcel. Fields separated by a road should be coded as separate fields. It would not be necessary to show the road as a separate land use unless the right-of-way was more than 50 yards wide. Adjacent areas of non-agricultural land may be outlined and coded as one field. For instance, an entire town would normally be shown as one field; you should indicate the land use code at several locations within these areas. In general, large land areas that contain no cultivated crops can be shown as one field and coded either as trees, water or non-agricultural depending upon the major use of the area. Single fields that are 5 acres or greater in size that lay within large untilled areas must be coded as separate fields. Also, if a single field appears on the photo as two colors, you should repeat the code for both colors. On the photo an area 1/4" x 1/4" is about 5 acres.

Within tilled areas in the segment, all areas 5 acres or greater in size that are not tilled must be coded. This includes farsteads, lakes, and areas that cannot be tilled because of uneven terrain, rocks, or bogs.

Office Photo: Later when you have completed one of the six blocks on the working photo you will have to transfer these codes to the second photo or office copy. You should select a time when you will not be disturbed for a couple of hours. Using the lead pencils provided with your kit, transfer all land use codes and field boundaries to the second photo. Follow the guidelines as required in Section 4.2 for outlining field boundaries that have changed.

Comments: Form D should be used to comment on specified fields that were not selected for periodic observation. In order to do this, the field must be assigned a unique, 2-digit field number. Do not use any number from 1 through 60 or 99, because they are reserved and have special meaning. If, for example, you wished to make special comments about a field of millet, the crop code printed on the aerial photo overlay might be ML/61. On Form D, you would write a comment for field number 61, crop code ML.

Mailing Instructions: Before mailing the Land Use Inventory to the State Office, complete the following steps:

(a) Be sure all entries are clear and legible, and that you have not missed coding any fields or land uses on the inventory.

(b) If any new crop codes were assigned, they must be indicated on the margin of the overlay.

(c) Attach a Form D if you have comments describing any unusual field conditions or have assigned a new crop code.

(d) All periodic fields must be numbered and outlined on the overlay clearly, if your site was selected for periodic observation.

(e) Review both photos to make sure that the correct data is reflected on both.

(f) Mail only the office copy photo with comments at this time.

Due Date: The inventory photo is due in the State Office as soon as you complete it, but no later than six weeks from the date you received your segment kit.

You will keep the working photo for later reference. The State Office will review the inventory prior to mailing it to Johnson Space Center, where an additional review will be done by the analysts at Houston, Texas. This will provide both offices with a mechanism to clarify any questions.

If your site was selected for inventory only, within approximately two to four weeks, you will be asked to return all survey materials. If your site was selected for periodic field observations, you will return the working photo at the end of the survey period.

5.1 General

Special segments have been established for wheat, barley, and sunflower in Cass County, North Dakota; and for corn and soybeans in Webster County, Iowa. These segments will require your cooperation with ASCS County Executive Director, NASA Aircraft flight control personnel, and the field instruments team from the Laboratory for Applications in Remote Sensing (LARS) at Purdue University. The purpose of these segments are to obtain aircraft spectrometer and scanner data to be used for calibration of Landsat sensor equipment; to better understand the reflectance of crops and soils and to assess the capability of current planned and future satellite sensors to detect crops, measure their stress, growth stage and evaluate their yield. There will be a platform located in each segment for the calibration of aircraft spectrometer and scanner data. Aircraft flights have been scheduled over the segment to coincide with several of the Landsat satellite pass dates. Aircraft flights will be at low altitude (200 ft.), medium altitude (1,500 to 25,000 ft.), and high altitude (60,000 ft.) on scheduled dates. An open meeting with area farm operators will have been held explaining the purpose of the segment, data to be collected, fields to be flown and dates of aircraft flights.

Agency Responsibility: ESS will be the site coordinator. ASCS will provide temperature and precipitation data readings at several fields within the segment. NASA will schedule all aircraft flights, maintain the calibration platform, and observe special field conditions. LARS will be responsible for arranging for personnel from a State University to make special ground instrument readings within selected fields. ESS will be responsible for the periodic field observations, and the Land Use Inventory of the segment.

Your job will be the same as defined in Section 3 and 4 of this manual except as follows:

Periodic Field Selection: Fields selected for periodic visit will be determined and numbered by NASA. Periodic visits will occur for up to 80 fields.

Form A: Initial Interview: After the selection of the periodic fields you will complete a line on Form A for each field that is planted to one of the ten crops of interest.

Form B: Periodic Observations: For each field that you have completed a Form A on, you will begin periodic observations, according to the observation calendar provided in your segment kit.

Form C: Final Interview: Complete a line on Form C as each periodic field is harvested.

Form D: Comments: Many of the fields selected by NASA for periodic observation will not be planted to a crop of interest. NASA has identified additional requirements for agronomic data related to other crops and field practices. Some of the fields that are along the flight line of the low altitude (200 ft.) aircraft will require periodic visits on these dates. For these fields you will complete a line on Form D, enter the field number, crop code and under comments report on field condition, cultural practices and any field utilization changes that have occured since your last visit.

Land Use Inventory: You will complete the land use inventory as required in Section 4, except you will be provided additional copies of black and white photography for scheduling your periodic visits as required and for maintaining a record of field boundary changes throughout the growing season.

Mailing Instructions and Due Dates: All periodic forms and the Land Use Inventory photo will be forwarded to your State Office as required.

Miscellaneous: Your cooperation and coordination with ASCS, NASA, LARS, and local university staff will be required. ASCS will maintain the aircraft flight schedule dates and you will be informed of any schedule changes. Special training will be provided as required for enumerators who work these segments.

6.1 SEA/AR

Provided only to states with SEA/AR segments.

ILLUSTRATION 2: PERCENT GROUND COVER CORN

A. 10%

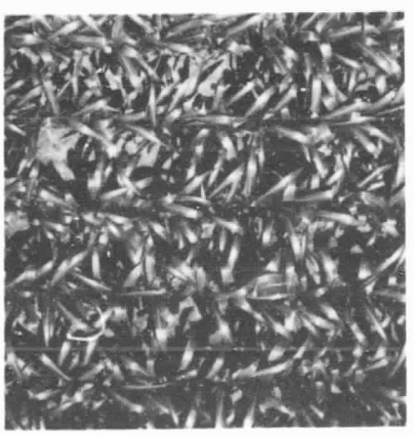
B. 25%

C. 40%

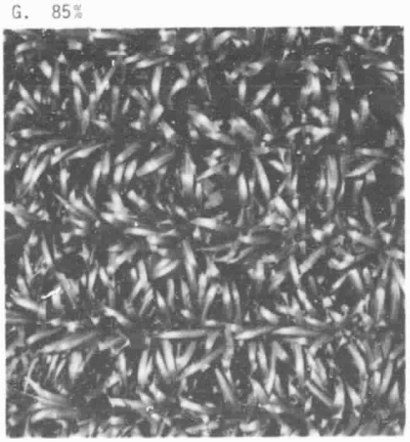
D. 50%

E. 55%

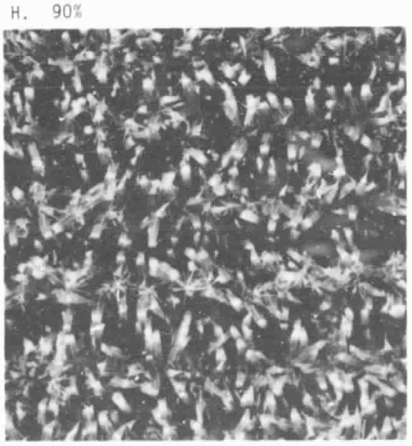
F. 75%



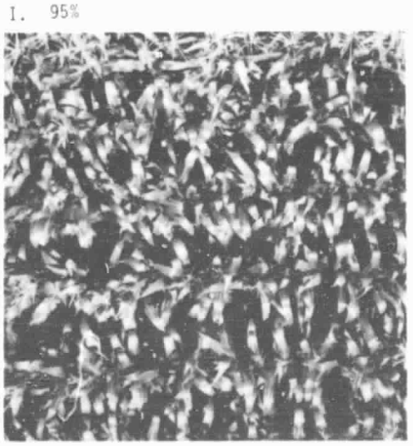
G. 85%



H. 90%



I. 95%



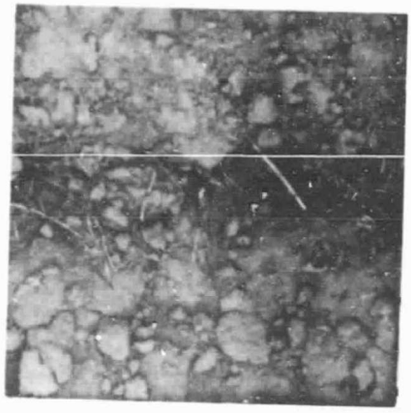
APPENDIX A

ILLUSTRATIONS

ORIGINAL PAGE
BLACK AND WHITE PHOTOGRAPH

ILLUSTRATION 1: PERCENT GROUND COVER SMALL GRAINS

A. 15%



B. 20%

C. 35%

D. 45%

E. 55%

F. 60%

G. 75%

H. 80%

I. 90%

ORIGINAL PAGE
BLACK AND WHITE PHOTOGRAPH

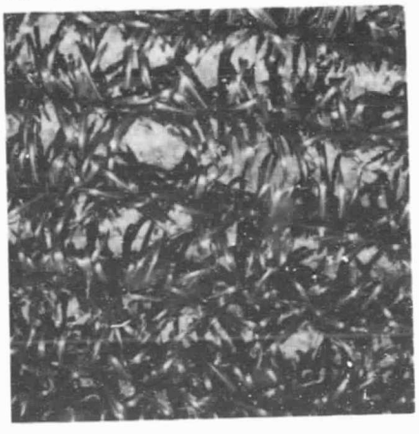
ILLUSTRATION 2: PERCENT GROUND COVER CORN

A. 10%

B. 25%

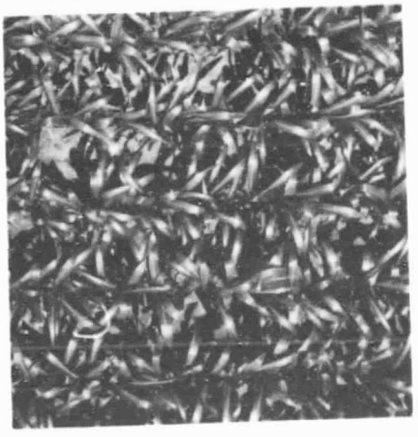
C. 40%

D. 50%

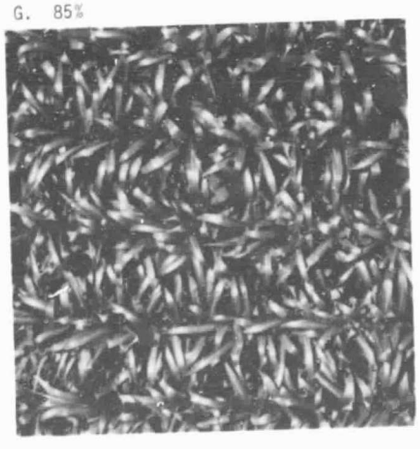


E. 55%

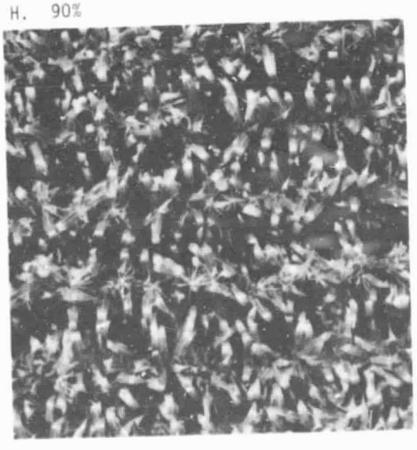
F. 75%



G. 85%



H. 90%



I. 95%

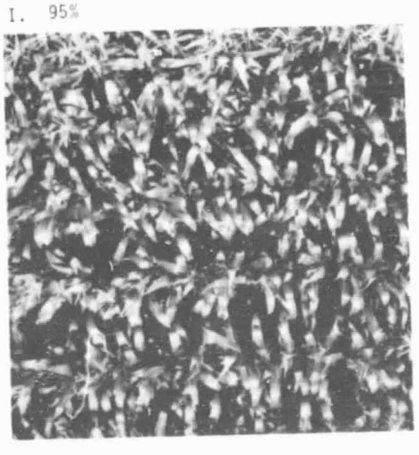
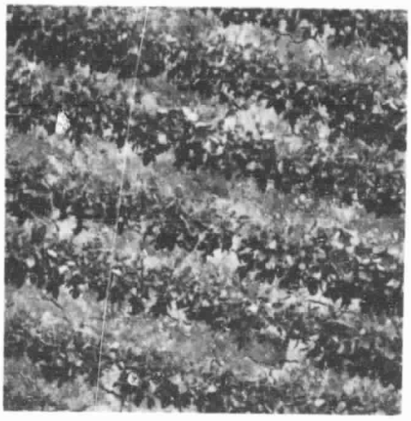


ILLUSTRATION 3: PERCENT GROUND COVER SOYBEANS AT DIFFERENT ROW WIDTHS

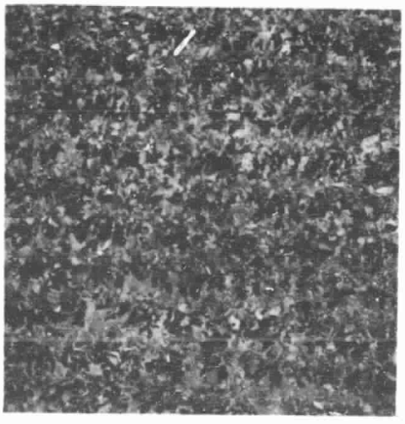
A. 20%/40"

B. 35%/20"

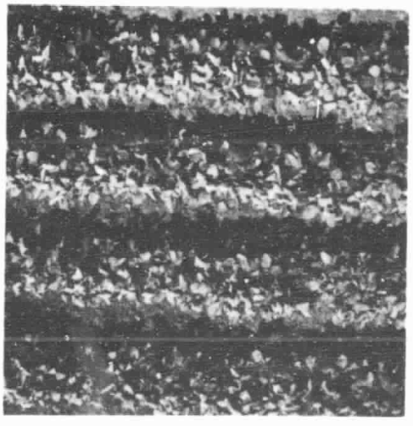


C. 50%/40"

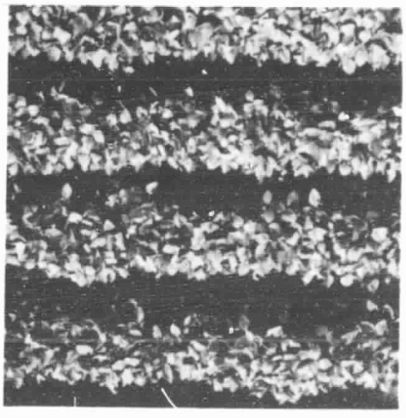
D. 50%/10"



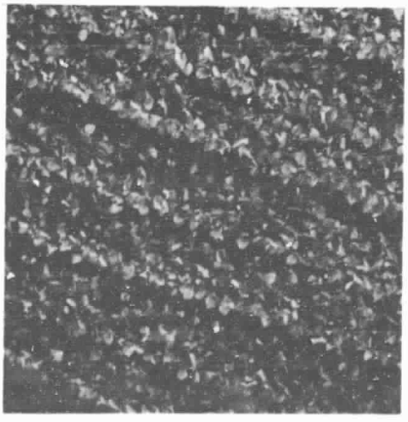
E. 65%/30"



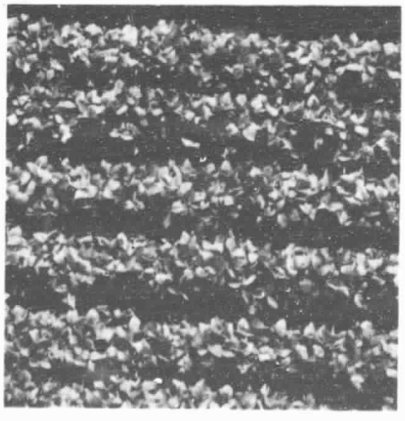
F. 75%/30"



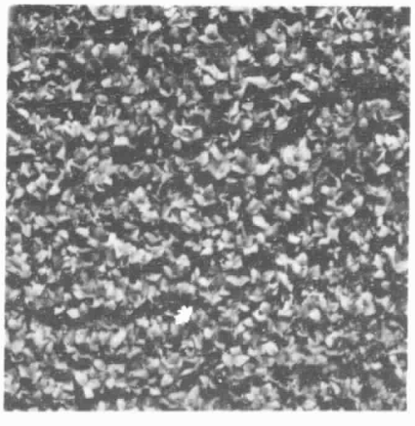
G. 80%/20"



H. 90%/20"



I. 100%/10"

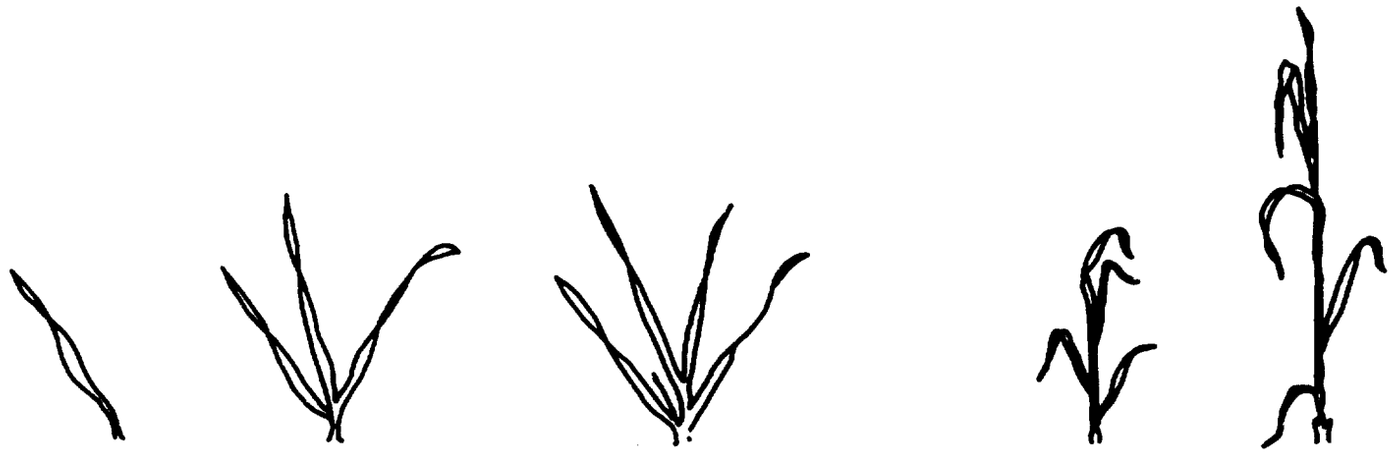


APPENDIX B

ILLUSTRATIONS

SELECTED CROP GROWTH STAGES

SELECTED GROWTH STAGES FOR WHEAT, BARLEY, RYE, OATS



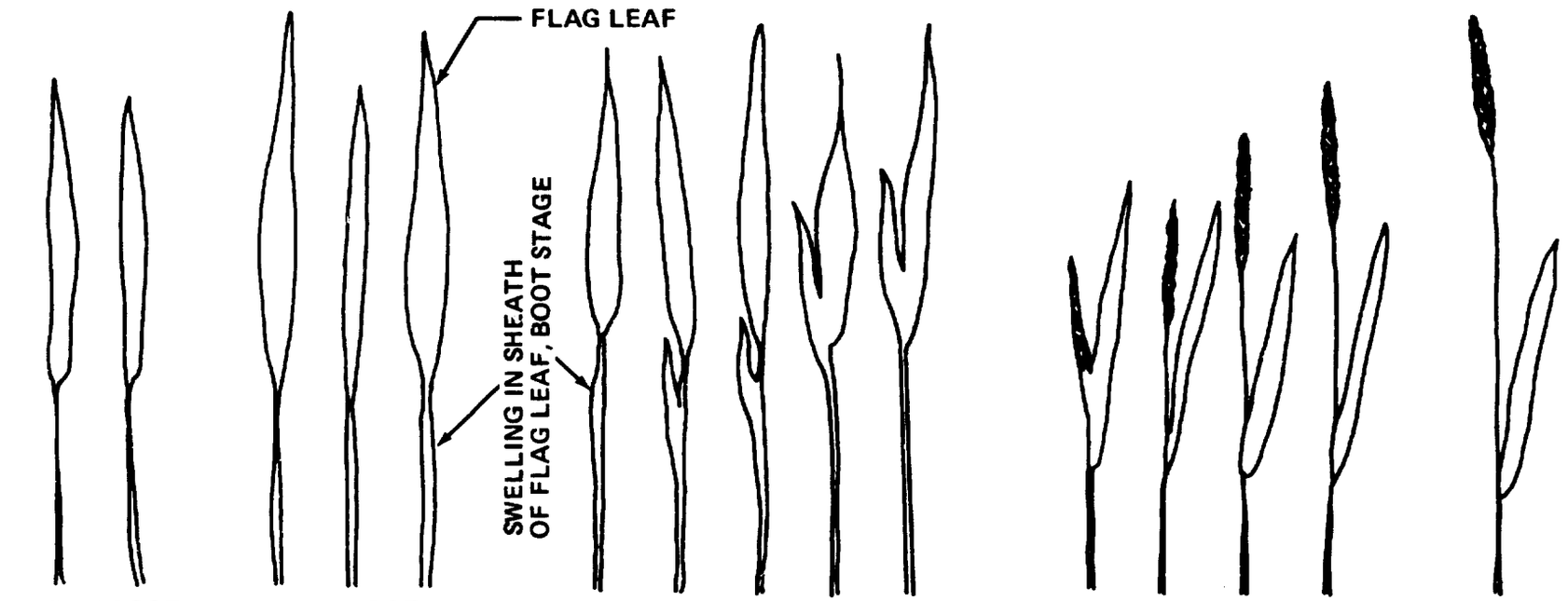
EMERGENCE OF SINGLE SHOOT STAGE 11

TWO-FIVE LEAVES STAGE 12

ONE-TWO TILLERS VISIBLE STAGE 13

FIRST NODE OF STEM VISIBLE STAGE 21

LAST LEAF JUST VISIBLE STAGE 23



EARLY BOOT STAGE 24

LATE BOOT STAGE 25

EARLY HEADING STAGE 31

HEADING COMPLETE STAGE 32

FLOWERING STAGE 33

SELECTED GROWTH STAGES FOR CORN

EMERGENCE STAGE 11

THREE TO FOUR LEAVES VISIBLE STAGE 21

FIVE TO EIGHT LEAVES VISIBLE STAGE 22

NINE TO TWELVE LEAVES VISIBLE STAGE 23

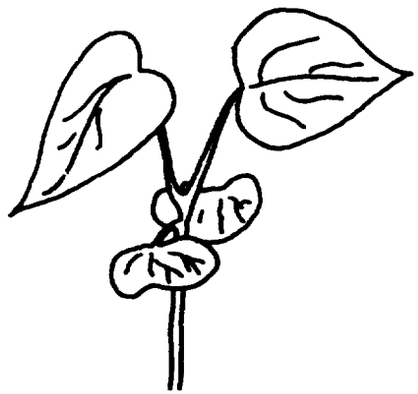
TIPS OF TASSEL VISIBLE STAGE 31

SILKS VISIBLE POLLEN SHEDDING STAGE 33

MATURITY STAGE 53

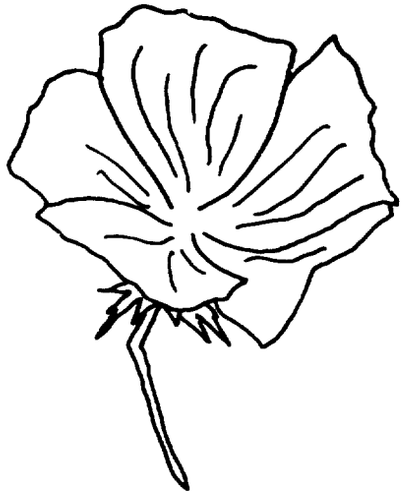
SELECTED GROWTH STAGES FOR COTTON

SEEDLING EMERGED
STAGE 11

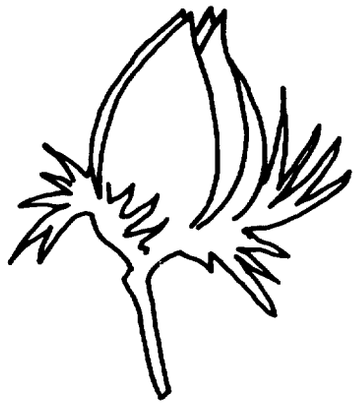


FIRST TRUE LEAVES
STAGE 12

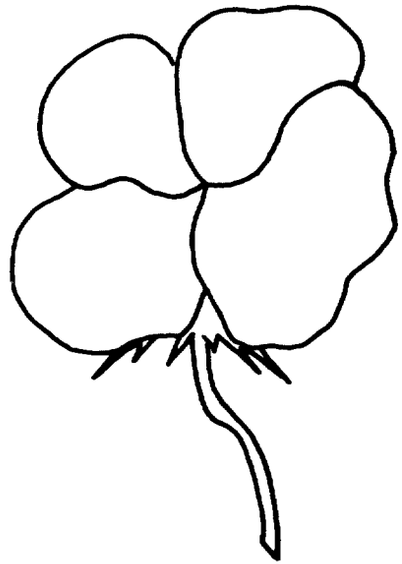
FIRST FLOWER BUD SQUARE
STAGE 31



FIRST OPEN BLOOM
STAGE 32



FIRST GREEN BOLLS
STAGE 33



FIRST BOLLS SPLIT
STAGE 51

SELECTED GROWTH STAGES FOR RICE

PRIMARY LEAF
STAGE 12

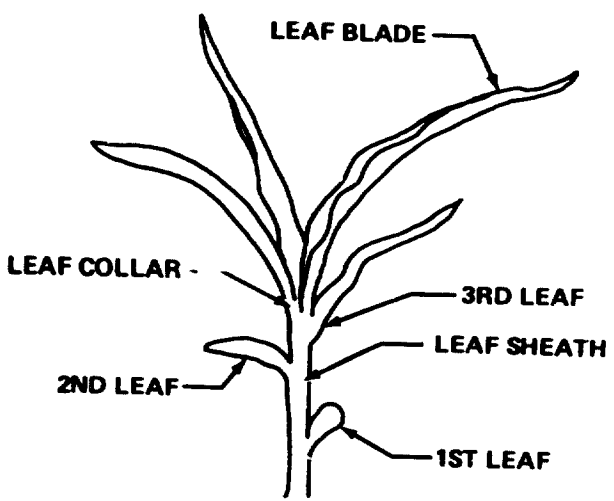
ACTIVE TILLERING
STAGE 13

FULL TILLERING
STAGE 14

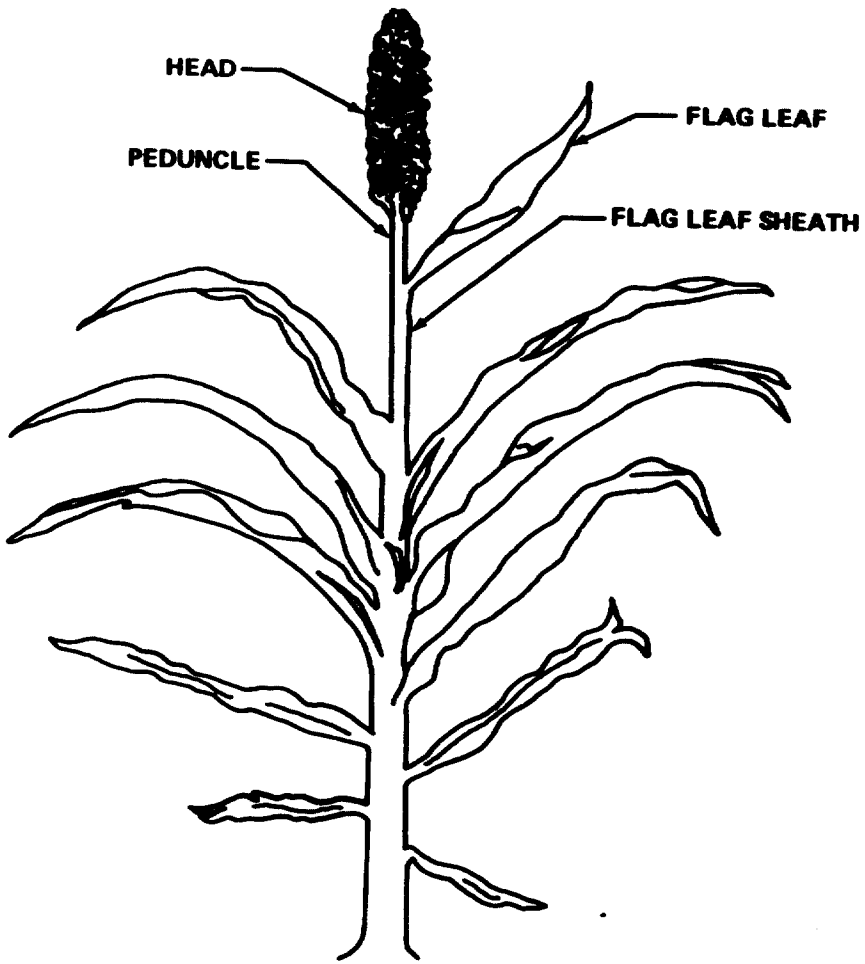
HEADING COMPLETE
STAGE 31

MATURITY
STAGE 52

SELECTED GROWTH STAGES FOR SORGHUM

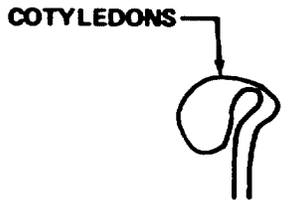


EMERGENCE THROUGH VEGETATION GROWTH
STAGE 10-20

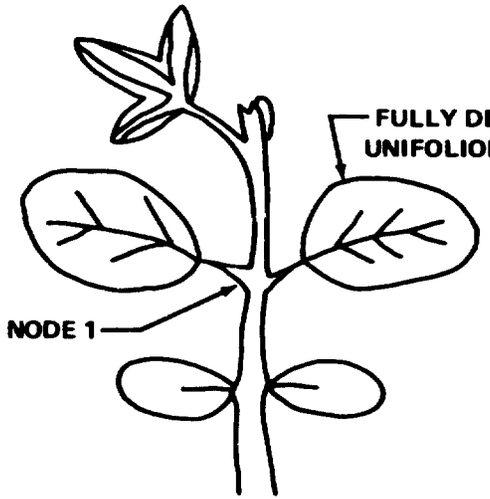


REPRODUCTIVE THROUGH MATURITY GROWTH
STAGE 30-50

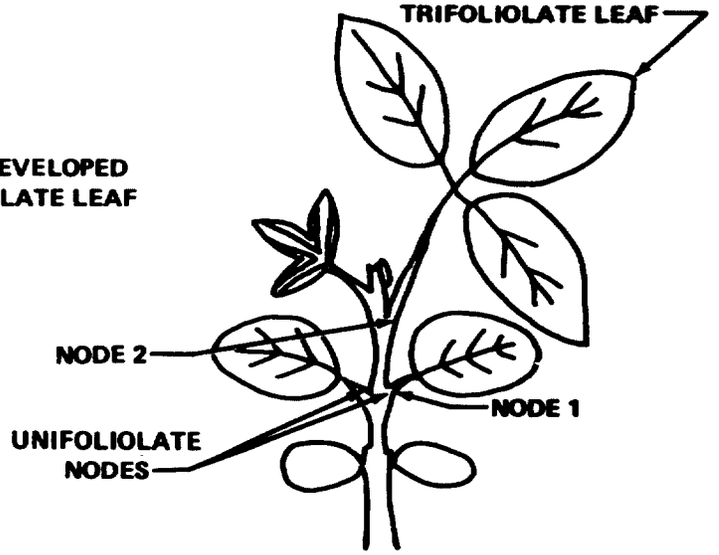
SELECTED GROWTH STAGES FOR SOYBEANS



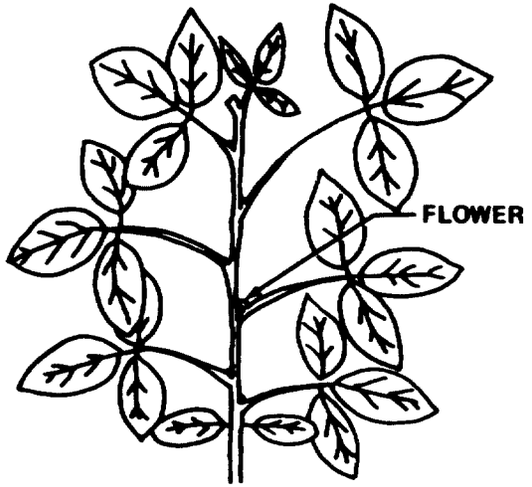
COTYLEDONS
EMERGED
STAGE 11



FIRST UNIFOLIOLATE
TRUE LEAVES
STAGE 12

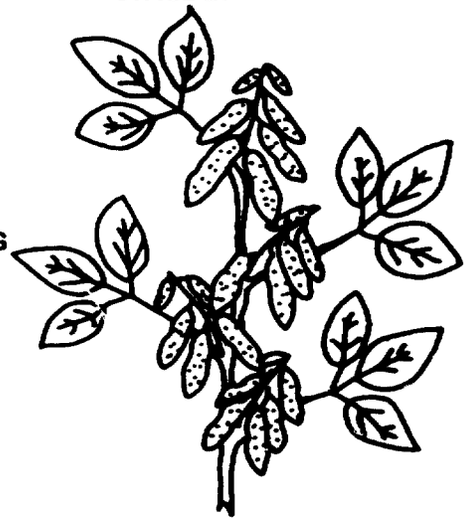


FIRST TRIFOLIOLATE
LEAF
STAGE 21



FIRST OPEN FLOWER
STAGE 31

BEGINING POD
STAGE 41



FULL SEED
STAGE 44

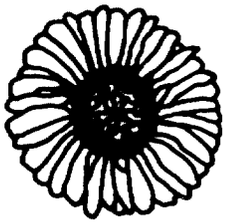
SELECTED GROWTH STAGES FOR SUNFLOWER

THIRD PAIR OF OPPOSITE LEAVES STAGE 14

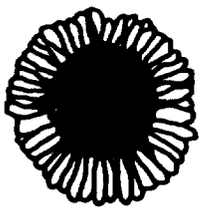
ALTERNATE LEAF PAIRS FORMED STAGE 23

FLOWER HEAD FULLY EXTENDED STAGE 33

FLOWER HEAD OPEN STAGE 34



FLOWERING AND POLLEN SHEDDING BEGINS STAGE 41

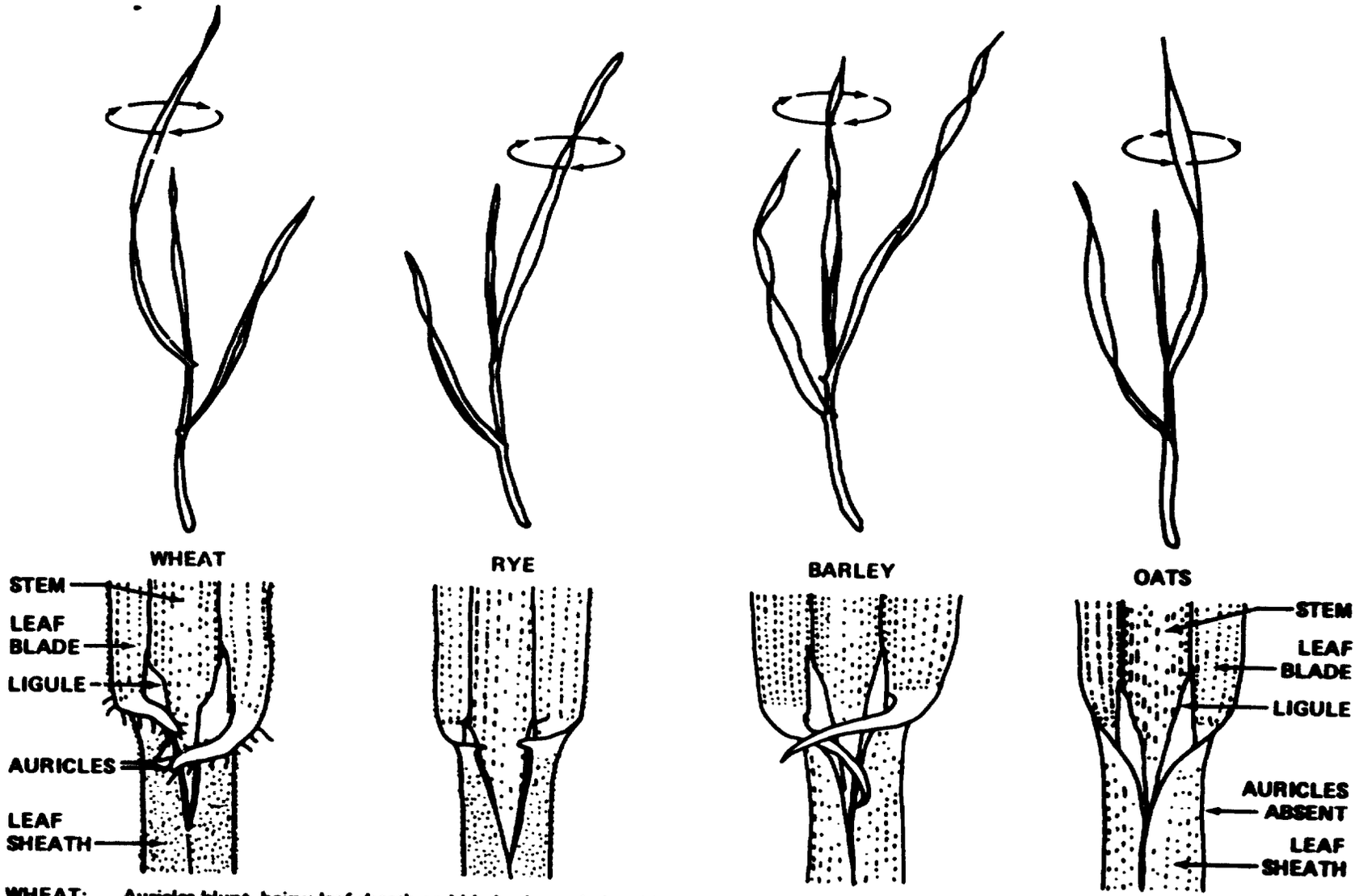


POLLEN SHEDDING COMPLETE STAGE 43

FLOWER HEAD INVERTED STAGE 51

MATURITY STAGE 53

SEPARATION OF WHEAT, RYE, BARLEY AND OATS IN VEGETATIVE STAGES



WHEAT: Auricles blunt, hairy; leaf-sheath and blade always hairy. Ligule medium length. Blades with about 12 veins, twisted clockwise.

RYE: Auricles very short, not hairy; leaf-sheath and blade variably hairy, greyish. Ligule short. Blades with about 12 veins, twisted clockwise.

BARLEY: Auricles long, slender, glabrous; leaf-sheath and blade usually glabrous (scattered long hairs in a few varieties). Ligule medium length. Blades with about 20 veins, twisted clockwise.

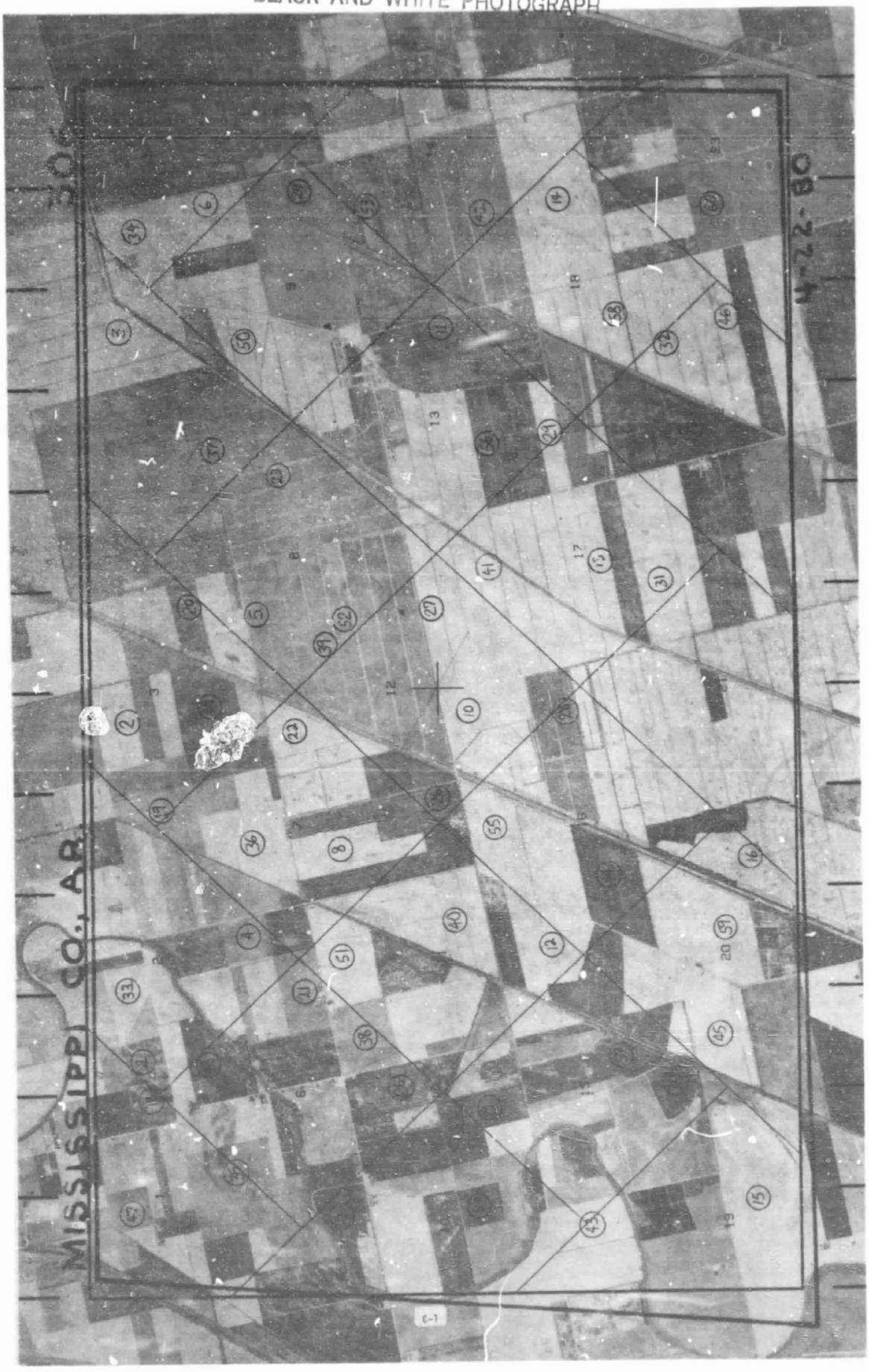
OATS: Auricles absent; leaf-sheath and blade usually glabrous, scattered long hairs in some varieties, especially of winter oats. Ligule medium length. Blades with about 12 veins, usually twisted anti-clockwise.

APPENDIX C-1

SAMPLE PERIODIC SITE

WITH RANDOM FIELDS AND RAIN GAUGE GRID

ORIGINAL PAGE
BLACK AND WHITE PHOTOGRAPH



APPENDIX C-2

SAMPLE SITE

COMPLETION OF LAND USE INVENTORY

NASA National Aeronautics and Space Administration

S81-26918

Lyndon B. Johnson Space Center
Houston, Texas 77058

ORIGINAL PAGE
COLOR PHOTOGRAPH

APPENDIX D

FORMS

Crop Reporting Board
Economics and Statistics Service
U.S. Department of Agriculture
Washington, D.C. 20250

1981 GROUND DATA SURVEY
FORM A: INITIAL INTERVIEW

Response to this survey is voluntary and not required by law. However, your cooperation will provide important assistance to remote sensing research. Information you provide is confidential and will be used only for the assessment of crop identification and production estimation techniques based on remote sensing by satellite.

OMB NUMBER 40-R-4074

ORIGINAL PAGE COLOR PHOTOGRAPH

STATE _____ CODE [1][2]

COUNTY _____

SEGMENT [4][5][6][7][8] A

COMPLETION DATE [18][19][20][21][22][23] 8 1 (MM/DD)

PAGE _____ OF _____

FIELD NUMBER			CROP CODE		ACRES PLANTED				PLANTING DATE (MM/DD)				EMERGENCE DATE (MM/DD)				SEEDING [1]						PREVIOUS FIELD USE CODE		IRRIGATED 1-YES 2-NO	FIELD OBSERVATIONS				PESTICIDES APPLIED[3]	VARIETY	NAME OF OPERATOR
																	RATE PER ACRE					UNIT				ROW [2] DIRECTION		ROW WIDTH				
24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	

[1] UNIT CODES: ("1" FOR POUNDS PER ACRE), ("2" FOR KERNELS OR SEEDS PER ACRE)

[2] ROW DIRECTION CODES: ("NS" FOR NORTH/SOUTH), ("EW" FOR EAST/WEST), ("NW" FOR NORTHWEST/SOUTHEAST), ("NE" FOR NORTHEAST/SOUTHWEST), ("CL" FOR CIRCLE), ("RS" FOR ROUND-THE-SQUARE), ("CN" FOR CONTOUR), ("BC" FOR BROADCAST)

[3] HAS OPERATOR APPLIED OR DOES OPERATOR INTEND TO APPLY AN ORGANOPHOSPHOROUS PESTICIDE TO THIS FIELD? CODE: "1" FOR YES, "2" FOR NO.

JSC FORM 809 JAN 1981 (OT)

Crop Reporting Board

Economics and Statistics Service

U.S. Department of Agriculture

Washington, D.C. 20250

1981 GROUND DATA SURVEY
FORM B: PERIODIC OBSERVATIONS

OMB NUMBER 40-R-4074

ORIGINAL PAGE COLOR PHOTOGRAPH

STATE _____ CODE [1][2] SEGMENT [4][5][6][7][8] B SATELLITE PASS DATE [11][12][13][14][15][16] 8 1 (MM/DD) OBSERVATION DATE [18][19][20][21][22][23] 8 1 (MM/DD)

COUNTY _____ PAGE _____ OF _____

FIELD NUMBER	CROP CODE	CANOPY HEIGHT (INCHES)	GROUND COVER CODE	CANOPY COLOR CODE	GROWTH STAGE CODE	SURFACE MOISTURE CODE	WEED-INESS CODE	DISEASE DAMAGE CODE	INSECT DAMAGE CODE	HAIL DAMAGE CODE	LODGING DAMAGE CODE	PESTI-CIDES APPLIED(1)	COMMENTS

(1) HAS OPERATOR APPLIED AN ORGANOPHOSPHORUS PESTICIDE TO THIS FIELD WITHIN 72 HOURS? CODE: "1" FOR YES, "2" FOR NO.

JSC FORM 809A (JAN 81) (OT)

PERIODIC OBSERVATION CODES

ORIGINAL PAGE
COLOR PHOTOGRAPH

The following codes have been summarized from Section 3.4.1 of the Enumerator's Manual to aid you in completing Form B. You should refer to the manual for a more descriptive definition as needed.

GROUND COVER

Code	Ground Cover Percent
1	0-10
2	11-20
3	21-30
4	31-40
5	41-50
6	51-60
7	61-70
8	71-80
9	81-90
10	Over 90
11	Not Observed

CANOPY COLOR

Code	Condition
1	Green tint appearance
2	Mostly green appearance
3	Upper plant growth green appearance
4	Slight green appearance
5	No green appearance
6	Not Observed

SURFACE MOISTURE

Code	Condition
1	Dry
2	Moist
3	Wet
4	Saturated
5	Standing water or irrigated
6	Not Observed

WEEDS

Code	Condition
1	None or few
2	Light weediness
3	Moderate weediness
4	Heavy weediness
5	Very heavy weediness
6	Not Observed

DISEASE

Code	Condition
1	None or few
2	Light infestation
3	Moderate infestation
4	Heavy infestation
5	Very heavy infestation
6	Not Observed

INSECTS

Code	Condition
1	None or slight
2	Light damage
3	Moderate damage
4	Heavy damage
5	Very heavy damage
6	Not Observed

HAIL

Code	Condition
1	None or slight
2	Light damage
3	Moderate damage
4	Heavy damage
5	Very heavy damage
6	Not Observed

LODGING

Code	Condition
1	None or slight
2	Light
3	Moderate
4	Severe
5	Very severe
6	Not Observed

1981 GROUND DATA SURVEY
FORM C: FINAL INTERVIEW

Crop Reporting Board
Economics and Statistics Service
U.S. Department of Agriculture
Washington, D.C. 20250

Response to this survey is voluntary and not required by law. However, your cooperation will provide important assistance to remote sensing research. Information you provide is confidential and will be used only for the assessment of crop identification and production estimation techniques based on remote sensing by satellite.

OMB NUMBER 40-R-4074

STATE _____ CODE [1][2] SEGMENT [4][5][6][7][8] = C COMPLETION DATE [18][19][20][21][22][23] = 8 1 (MM/DD)

COUNTY _____ PAGE _____ OF _____

FIELD NUMBER	CROP CODE	CONTACT DATE (MM/DD)	ACRES HARVESTED	HARVEST DATE (MM/DD)	PRODUCTION (1) PER ACRE	PRODUCTION (1) ENTIRE FIELD	UNIT CODE	PERCENT MOISTURE AT HARVEST	HARVEST METHOD CODE (2)	FIRST FERTILIZER APPLICATION LBS PER ACRE	FIRST FERTILIZER APPLICATION % (N) NITROGEN	FIRST FERTILIZER APPLICATION % (P_2O_5) PHOSPHATE	FIRST FERTILIZER APPLICATION % (K_2O) POTASH	SECOND FERTILIZER APPLICATION LBS PER ACRE	SECOND FERTILIZER APPLICATION % (N) NITROGEN	SECOND FERTILIZER APPLICATION % (P_2O_5) PHOSPHATE	SECOND FERTILIZER APPLICATION % (K_2O) POTASH	SECOND CROP? CODE	SECOND CROP? IF YES ENTER CROP CODE
03 04 05	07 08	09 10 11 12	13 14 15 16	17 18 19 20	41 42 43 44	45 46 47 48 49	50	51 52	53 54	55 56 57 58	59 60	61 62	63 64	65 66 67 68	69 70	71 72	73 74	75	76 77

(1) UNIT CODES: ("1" FOR BUSHELS INCLUDING SHELL CORN), ("2" FOR BUSHELS EAR CORN), ("3" FOR CWT. — HUNDRED WEIGHT), ("4" FOR POUNDS), ("5" FOR TONS)

(2) HARVEST METHOD CODES: ("H1" FOR COMBINED), ("H2" FOR MECHANICAL PICKER — — COTTON OR CORN), ("H3" FOR WINDROW AND COMBINE), ("H4" FOR MOW, RAKE AND BALE), ("H5" FOR WINDROW AND BALE), ("H6" FOR WINDROW AND CHOP), ("H7" FOR CHOP), ("H8" FOR PELLETIZE), ("H9" FOR OTHER — — EXPLAIN ON FORM D)

(3) WILL ANOTHER CROP BE PLANTED WHICH WILL BE HARVESTED BEFORE DECEMBER 31? CODE "1" FOR YES, "2" FOR NO.

JSC FORM 8098 (JAN 81) (OT)

Crop Reporting Board
Economics and Statistics Service
U.S. Department of Agriculture
Washington, D.C. 20250

1981 GROUND DATA SURVEY
FORM D: COMMENTS

STATE _____ CODE [1][2] SEGMENT [4][5][6][7][8] = D COMPLETION DATE [18][19][20][21][22][23] = 8 1 (MM/DD)

COUNTY _____

PAGE _____ OF _____

FIELD NUMBER				CROP CODE			COMMENT DATE (MM/DD)					COMMENTS
24	25	26		27	28		29	30	31	32		33

JSC FORM 809C (JAN 1981) (OT)

Crop Reporting Board

Economics and Statistics Service

U.S. Department of Agriculture

Washington, D.C. 20250

1981 GROUND DATA SURVEY
FORM E: RAINFALL OBSERVATIONS

OMB NUMBER 40-R-4074

ORIGINAL PAGE
COLOR PHOTOGRAPH

Rainfall data will be used in remote sensing research to study the ability of satellite mounted sensors to adequately detect crop response to naturally occuring rainfall patterns. The assistance you provide by recording rain guage measurements is voluntary and not required by law.

STATE	1	2
CODE		

COUNTY	4	5	6	7	8	9	10
	E						
	SEGMENT					GRID AREA	

MONTH	18	19	20	21
MAY	8	1	0	5
	(YY/MM)			

DATE / DAY	PRECIPITATION INCHES	1/10	1/100
1 FRI			
2 SAT			
3 SUN			
4 MON			
5 TUE			
6 WED			
7 THU			
8 FRI			
9 SAT			
10 SUN			
11 MON			
12 TUE			
13 WED			
14 THU			
15 FRI			
16 SAT			
17 SUN			
18 MON			
19 TUE			
20 WED			
21 THU			
22 FRI			
23 SAT			
24 SUN			
25 MON			
26 TUE			
27 WED			
28 THU			
29 FRI			
30 SAT			
31 SUN			

(NAME) (DATE)

JSC FORM 809D JAN 1981 (OT)

RAINFALL OBSERVATION

Thank you for agreeing to monitor the rain gauge that was placed near your home. You are among a group of approximately 1200 people located throughout the major agricultural areas of the United States who will be reading these gauges during most of the 1981 crop season. Depending on your location, you may be the only person in your area who is performing this service. In other areas, about 20 of your closest neighbors will also be reading rain gauges for this project. In either case, we have established several guidelines to insure the information you record will be of maximum use in the research project.

Recording Rainfall: We ask that you attempt to read your rain gauge at about the same time each day (early-morning hours are preferred) and that you empty the gauge immediately after it is read. On the back of this form, record your readings on the line that represents the current date and day. Because of shape of the gauges, the accuracy to which it can be read varies with the amount of rainfall. We ask that the reading you record be for the line closest to the actual water level in the gauge. It is important to note that each line below .20 represents .01 (1/100) inch, that each line between .20 and 1.00 represents .02 (2/100) inch and that each line above 1.00 represents .05 (5/100) inch. Rainfall of more than 6 inches can be recorded if the gauge is dumped and read more than once per day. If rainfall exceeds 6 inches in any 24 hour period and your gauge runs over, record -6.00 on the form to indicate what happened. If you successfully made multiple readings, enter the sum of the readings on the form. On days when there is no rainfall just leave the line on the form blank. When you are away from home or for some other reason are unable to monitor the gauge for more than 24 hours, please enter -.01 for each day that you missed. Be sure to dump your gauge before you resume recording daily rainfall. For each entry four columns have been provided, two for whole inches, one for tenths (1/10), and one for hundreds (1/100). A sample reading of 4 inches, 2 tenths, and 5 hundreds would be recorded on the form as

	4	2	5

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Completed forms are to be picked up each month by the enumerator who left the gauge. The pick-up date will vary from month to month depending upon the enumerator's work schedule and may be as late as 2 weeks after the first of the month. The enumerator will let you know when to expect her/him.

The rain gauge is yours to keep. If instructions for its maintenance and care are followed, it can provide accurate measurements of rainfall for many years. Again, thank you for agreeing to help.

Crop Reporting Board

Economics and Statistics Service

U.S. Department of Agriculture

Washington, D.C. 20250

1981 GROUND DATA SURVEY
FORM E: RAINFALL OBSERVATIONS

OMB NUMBER 40-R-4074

ORIGINAL PAGE
COLOR PHOTOGRAPH

Rainfall data will be used in remote sensing research to study the ability of satellite mounted sensors to adequately detect crop response to naturally occuring rainfall patterns. The assistance you provide by recording rain guage measurements is voluntary and not required by law.

STATE _____ (1 2 CODE)

COUNTY _____

(4 5 6 7 8 9 10 SEGMENT / GRID AREA): E

MONTH (18 19 20 21): JUNE 8 1 0 6 (YY/MM)

DATE / DAY	PRECIPITATION INCHES	1/10	1/100	DATE / DAY	PRECIPITATION INCHES	1/10	1/100	DATE / DAY	PRECIPITATION INCHES	1/10	1/100
1 MON				11 THU				21 SUN			
2 TUE				12 FRI				22 MON			
3 WED				13 SAT				23 TUE			
4 THU				14 SUN				24 WED			
5 FRI				15 MON				25 THU			
6 SAT				16 TUE				26 FRI			
7 SUN				17 WED				27 SAT			
8 MON				18 THU				28 SUN			
9 TUE				19 FRI				29 MON			
10 WED				20 SAT				30 TUE			

_____ (NAME)

_____ (DATE)

JSC FORM 809E JAN 1981 (OT)

Crop Reporting Board

Economics and Statistics Service

U.S. Department of Agriculture

Washington, D.C. 20250

1981 GROUND DATA SURVEY

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STATE _____ (1 2 CODE)

COUNTY _____

(4 5 6 7 8 9 10) E [ ] [ ] [ ] [ ] [ ] [ ] SEGMENT GRID AREA

(18 19 20 21) MONTH JULY 8 1 0 7 (YY/MM)

DATE DAY	PRECIPITATION INCHES	1/10	1/100
1 WED			
2 THU			
3 FRI			
4 SAT			
5 SUN			
6 MON			
7 TUE			
8 WED			
9 THU			
10 FRI			
11 SAT			
12 SUN			
13 MON			
14 TUE			
15 WED			
16 THU			
17 FRI			
18 SAT			
19 SUN			
20 MON			
21 TUE			
22 WED			
23 THU			
24 FRI			
25 SAT			
26 SUN			
27 MON			
28 TUE			
29 WED			
30 THU			
31 FRI			

_____ (NAME) _____ (DATE)

Crop Reporting Board

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FORM E: RAINFALL OBSERVATIONS

OMB NUMBER 40-R-4074

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COLOR PHOTOGRAPH

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STATE _____ (1 2 CODE)

COUNTY _____

(4 5 6 7 8 9 10 SEGMENT GRID AREA) E

(MONTH 18 19 20 21 (YY MM)) AUGUST 8 1 0 8

DATE / DAY	PRECIPITATION INCHES	1/10	1/100
1 SAT			
2 SUN			
3 MON			
4 TUE			
5 WED			
6 THU			
7 FRI			
8 SAT			
9 SUN			
10 MON			
11 TUE			
12 WED			
13 THU			
14 FRI			
15 SAT			
16 SUN			
17 MON			
18 TUE			
19 WED			
20 THU			
21 FRI			
22 SAT			
23 SUN			
24 MON			
25 TUE			
26 WED			
27 THU			
28 FRI			
29 SAT			
30 SUN			
31 MON			

(NAME) _____ (DATE) _____

JSC FORM 809G JAN 1981 (OT)

RAINFALL OBSERVATION

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STATE _____ CODE (1 2)

COUNTY _____

4	5	6	7	8	9	10
E						

SEGMENT — GRID AREA

MONTH	18	19	20	21
SEPTEMBER	8	1	0	9

(YY/MM)

DATE / DAY	PRECIPITATION INCHES	1/10	1/100
1 TUE			
2 WED			
3 THU			
4 FRI			
5 SAT			
6 SUN			
7 MON			
8 TUE			
9 WED			
10 THU			
11 FRI			
12 SAT			
13 SUN			
14 MON			
15 TUE			
16 WED			
17 THU			
18 FRI			
19 SAT			
20 SUN			
21 MON			
22 TUE			
23 WED			
24 THU			
25 FRI			
26 SAT			
27 SUN			
28 MON			
29 TUE			
30 WED			

_____ (NAME)

_____ (DATE)

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